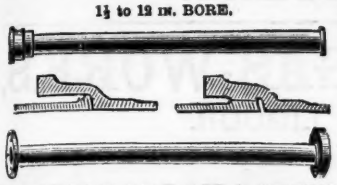
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVIII. No. 1482.] LONDON, OCTOBER 6, 1891. [43RD YEAR. Price 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.



THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

GLASGOW OFFICE: 24, GEORGE SQUARE.
Telegrams:
"BONLEA, STOCKTON-ON-TEES."
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— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.

THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.

WORKS:
ORMSIDE STREET, OLD KENT ROAD, LONDON.

WOLSTON'S
TORBAY PAINTS
Special Quotations to Gas Companies.
DARTMOUTH, DEVON.

CEMENT
EARLE'S
BEST
Portland Cement
MANUFACTURED BY
GEO. & THOS. EARLE,
HULL.

Offices: 7, 8, & 9, PIER STREET.
Works: WILMINGTON.
STOREAGE CAPACITY 10,000 Tons.

ESTABLISHED 1811—OVER THREE QUARTERS OF A CENTURY.
Telegraphic Address: "CEMENT HULL."

PURIMACHOS GAS CEMENT

Capable of withstanding Greater Heat than that adequate to the Fusion of Iron.

Supplied to Her Majesty The Queen; to His Royal Highness The Prince of Wales; and to Her Majesty's Government; to Foreign Governments; and to public and private Gas-Works, &c., in GREAT BRITAIN and IRELAND, in ALL THE COLONIES, and in EVERY OTHER PART OF THE WORLD where Gas is used.

PURIMACHOS is regularly and increasingly used in GAS-WORKS at home and abroad, and has received the special commendation of the most distinguished Engineers and Managers, as invaluable for promptly and economically building, glazing, repairing, and consolidating RETORTS and FURNACES (in and out of action), PIPES, and ALL OTHER ERECTIONS (of Clay, Brick, or Iron) where FIRE or HEAT is employed—the action of which it will effectually resist.

The Highest Testimonials and References from Eminent Authorities, at home and abroad, in support of the foregoing statements.

Registered Telegraphic Address: "PURIMACHOS, BRISTOL." | Prices and further particulars on application to **THE MANAGER, BRISTOL PURIMACHOS WORKS, REDLAND, BRISTOL.**

PATENT SULPHATE OF AMMONIA PLANT.

C. & W. WALKER.

PATENT MURIATE OF AMMONIA PLANT.
PATENT LIQUID AMMONIA PLANT.
PATENT TAR PLANT.

Makers of the most perfect form of Apparatus for the Manufacture of Sulphate, Muriate, Liquid Ammonia and Tar Products.

Apparatus already erected have proved more economical in consumption of Fuel, Simplicity, and Cheapness of Working than any known Plant.

Sole Makers of Claus' Patent

SULPHUR RECOVERY PLANT

for recovering Sulphur from Waste Gases containing Sulphuretted Hydrogen.
Testimonials & Estimates on Application.

8, FINSBURY CIRCUS, LONDON, E.C.; MIDLAND IRON-WORKS, DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

SAWER AND PURVES,

LATE

FLETCHER AND MURPHY,

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Manufacturers of

IMPROVED CONSUMERS' WET GAS-METERS

IN CAST-IRON CASES,

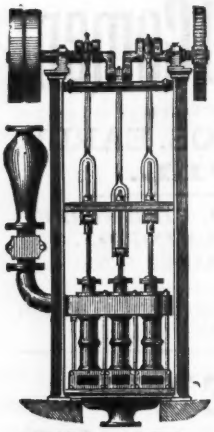
THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS.

STEAM & HAND PUMPS FOR GAS-WORKS,

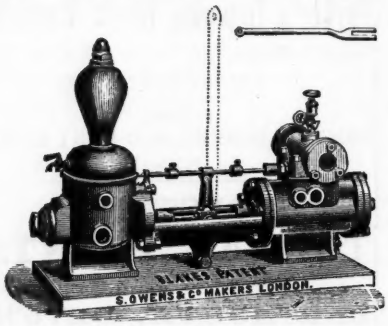
FOR PUMPING TAR, WATER, AND LIQUOR.



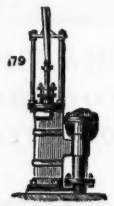
Treble-Barrel Pumps in Frame.

Syphon Pump.

Double-Barrel Force-Pump in Frame.



BLAKE'S
PATENT
STEAM PUMPS.
20,000 IN USE.



Improved Double Action Pump.

Cast-Iron Hand-Pump.

Wrought-Iron Portable Pump.

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SOLE MANUFACTURERS OF

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S. O. and Co.'s New Catalogue of Gas Apparatus and General Machinery can be had on application.

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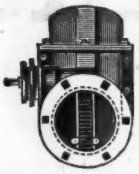
THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

SLIDE VALVES,
WITH RACK & PINION,
OR
Internal or External
SCREWS, of all Sizes.

GASHOLDERS,
AND
Gasholder Tanks.



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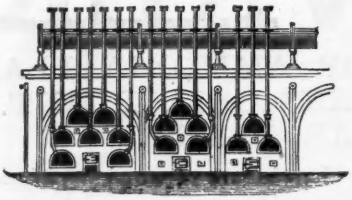
And Retort-House Appliances

of every description.

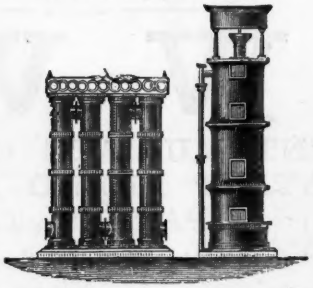
Iron Roofs, Columns, Girders, Floor Plates and Tools, &c.



WROUGHT AND CAST IRON

CONDENSERS,
SCRUBBERS, & WASHERS,

TAR AND LIQUOR PUMPS, &c.



PATENT

CENTRE VALVES

for working Purifiers.

Also Bye-Pass & Stop Valves.

PURIFIERS with Planed Joints,

HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS and SPECIALS,

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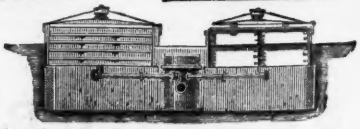

DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

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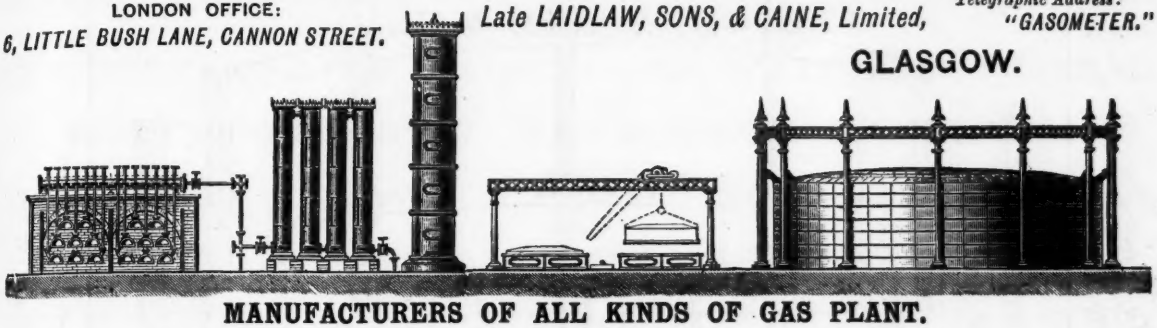

MANUFACTURERS OF ALL KINDS OF GAS PLANT.

RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
CONDENSERS, EXHAUSTERS, AND ENGINES; SCRUBBERS, WASHERS;
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HYDRAULIC AND HAND-POWER LIFTING APPARATUS;
GASHOLDERS, SINGLE-LIFT & TELESCOPE; CAST & WROUGHT IRON TANKS;
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FOUR-WAY COCKS AND HYDRAULIC VALVES;
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IRON ROOFING, MARKET BUILDINGS, BRIDGES, GIRDERS, STEAM BOILERS;
PROMENADE PIERS AND LOADING WHARVES.

MANUFACTURERS OF OIL PLANT OF EVERY DESCRIPTION.

HENDERSON'S Patent Retorts, Condensers, Stills, Cast and Wrought Iron Tanks, Ammonia Stills, Wrought-Iron Gas-Mains, &c., &c.

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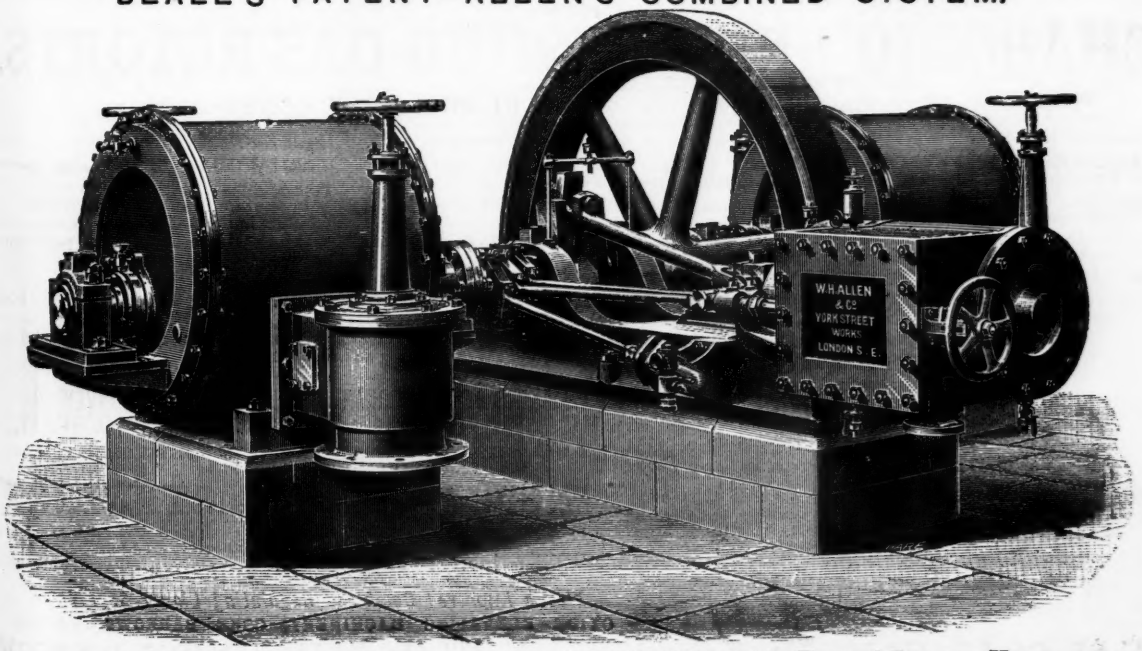
York Street Works, LAMBETH, LONDON, S.E.,

MAKERS OF THE MOST IMPROVED FORM OF

GAS EXHAUSTING MACHINERY.

BEALE'S PATENT—ALLEN'S COMBINED SYSTEM.

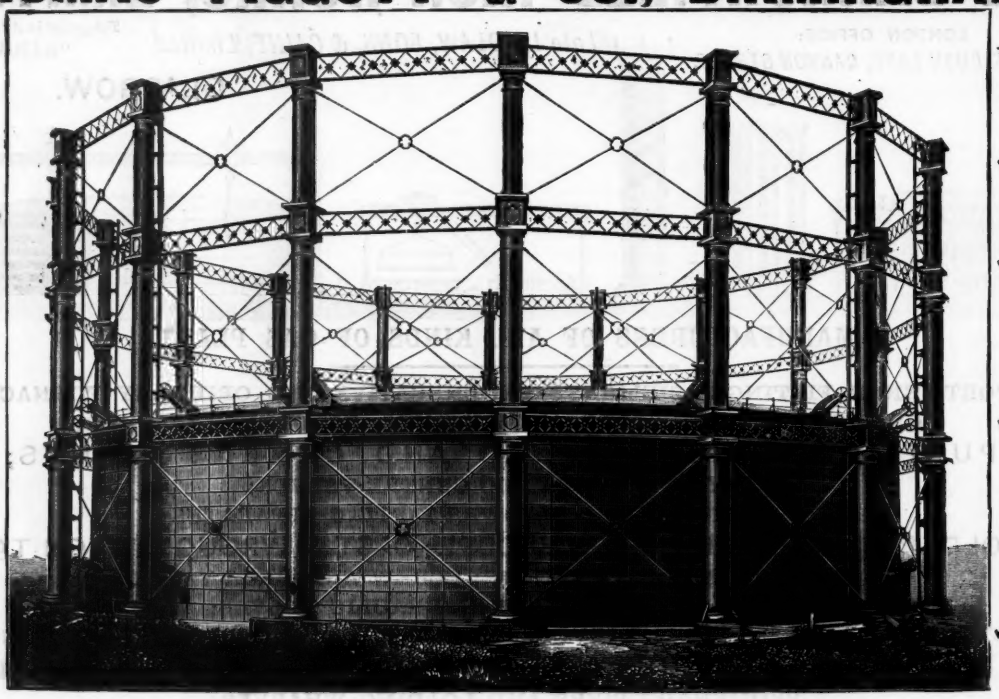


Pair of Non-Oscillating Exhausters, passing 200,000 Cubic Feet of Gas per Hour.

THOMAS PIGGOTT & CO., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS, BIRMINGHAM.

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, & CAST TANKS, PURIFIERS.

OVER 500 GASHOLDERS HAVE BEEN SUPPLIED AND ERECTED,

INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

BATH.	BOLTON.	BRISTOL.	CHELTENHAM.	LEAMINGTON.	PRESTON.	SHEFFIELD.
BELFAST.	BOMBAY.	BRISBANE.	HARTLEPOOL.	LIVERPOOL.	READING.	STOCKHOLM.
BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
BIRMINGHAM.	BRIGHTON.	COVENTRY.	LEICESTER.	OLDHAM.	SOUTH METRON.	VIENNA.

WEST'S GAS IMPROVEMENT Co., Ltd.,

Engineers, Ironfounders, & Contractors,

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

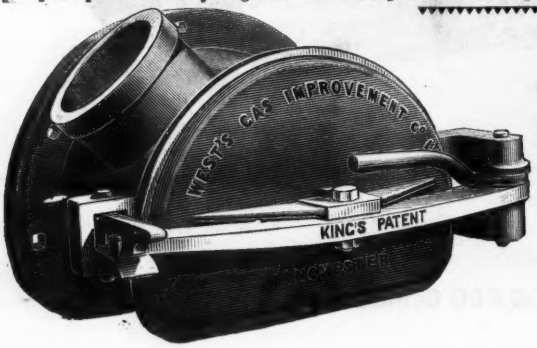
Advantages attending its use are:

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE. The power machines are applicable to circular, oval, or D-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



MAKERS OF COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY, COKE BREAKING AND WASHING MACHINERY.

Sole Makers of CIRCULAR, OVAL, or D-shaped MOUTHPIECES with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

West's Improved Combined Regulating Liquor Seal Valve.

OXIDE ELEVATING MACHINERY, COKE BARROWS, VALVES, AND ALL GAS-WORKS PLANT, &c.

Illustrated Catalogue sent upon application.

Mr. JOHN WEST, M. Inst. C.E., *Managing Director.*

JOSEPH CLIFF & SONS,

INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,

WORTLEY, LEEDS.

LONDON Offices & Depôts:
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WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.

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MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

WORKS
HUNSLET.
LEEDS

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E.C.

CLAYTON SON & CO. LTD.

MAKE A

SPECIALTY

OF

GASHOLDERS

AND MAKERS OF

REG^D TELEGRAPHIC ADDRESS: "GAS LEEDS"

GAS PLANT OF EVERY DESCRIPTION.

THE WIGAN COAL & IRON CO., LIM^TD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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LONDON DISTRICT OFFICE: 6, STRAND, LONDON—C. PARKER & SON, SOLE AGENTS.

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Engineers, Ironfounders, and Contractors,

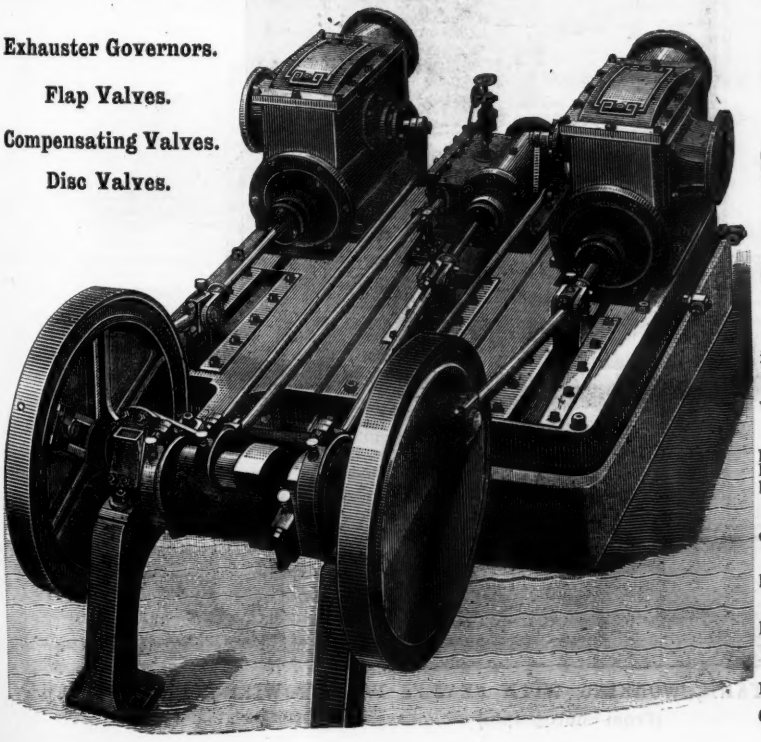
GAS PLANT WORKS, NEWTON HEATH, MANCHESTER.

Exhauster Governors.

Flap Valves.

Compensating Valves.

Disc Valves.



GAS EXHAUSTERS.

COMBINED

Steam-Engine and Double-Cylinder

RECIPROCATING

GAS EXHAUSTERS.

These Exhausters work without oscillation, keeping a perfectly steady gauge.

They will force against the highest pressures without slip.

They are substantial in design. The working parts are finished bright, and are provided with large wearing surfaces to ensure durability, and being external, they are easily got at for repairs.

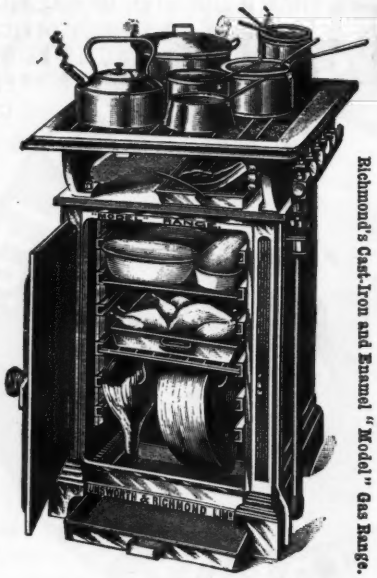
They are very economical in the consumption of steam.

The workmanship and materials are of the highest class.

They are made in all sizes, from 2000 feet per hour upwards.

Three of these Exhausters recently made by us are passing 60 million cubic feet of Gas per day.

The best Stove made for Hiring out purposes. Can be taken to pieces readily.



Richmond's Cast-Iron and Enamel "Model" Gas Range.

RICHMOND & CO., LTD.,

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WARRINGTON.

GREAT SUCCESS of RICHMOND'S MODEL GAS RANGE. Beat Six well-known Makers. Nelson, June 2, 1891.

Quick Lever Grill.
No. 200 10×9×7½, 7/-. No. 205 12½×11×8, 10

Burners suitable for heavy work.
No. 300 12ft., 2/6. No. 302 16ft., 3/6. No. 304 20ft.

As Block. Plain Reeded Rim.
No. 306, 1/3. No. 313, 1/6. No. 315, 3/6.
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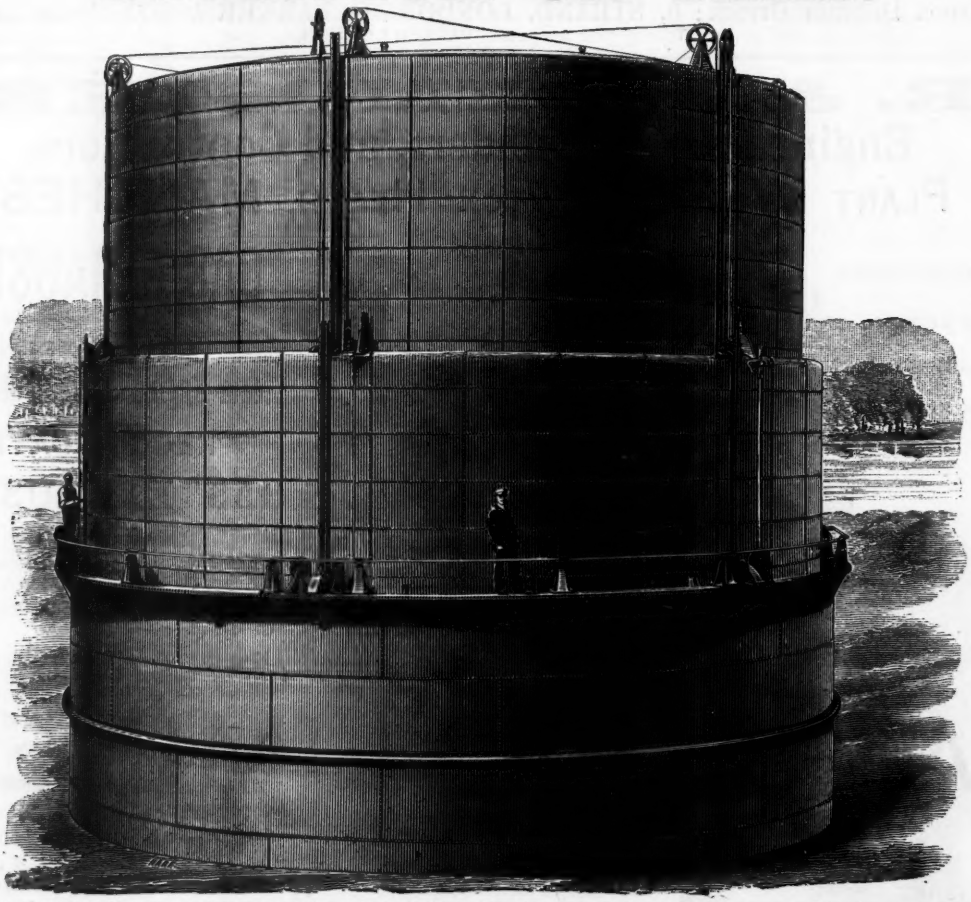
Hot Plate Burners, all loose for cleaning. Jet and Cock combined. Best Stove Extant. Repeat Orders Daily. Try it!

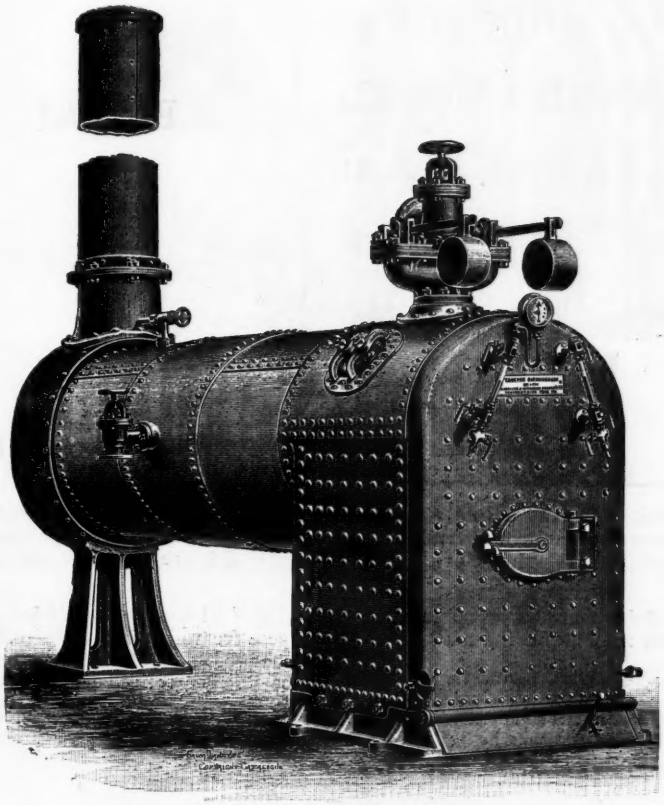
ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES.

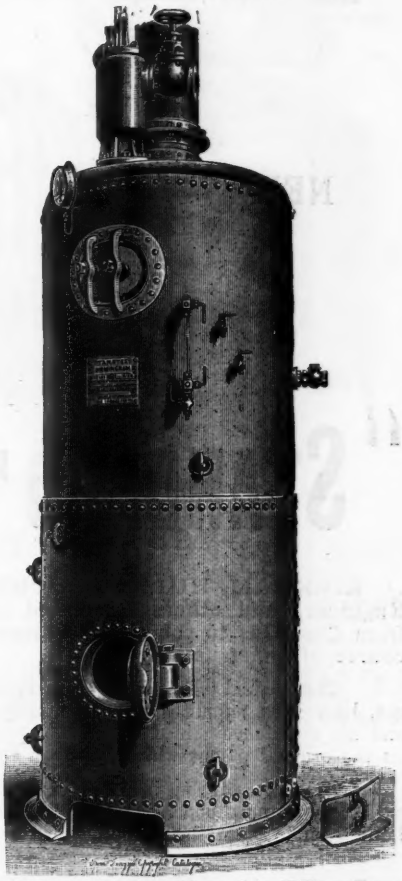


TWO-LIFT GASHOLDER, WITH TANK, WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

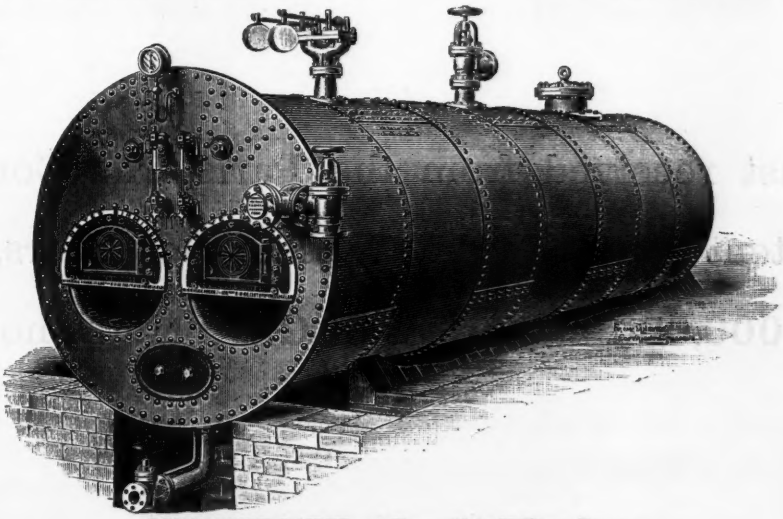
TANGYES' REVISED STEEL BOILERS.



"LOCO." BOILER. 12 Sizes—6 to 40 Horse Power.



VERTICAL BOILER. 7 Sizes—3 to 14 Horse Power.



LANCASHIRE BOILER. 6 Sizes—30 to 55 Horse Power.

QUOTATIONS ON RECEIPT OF NECESSARY DATA.

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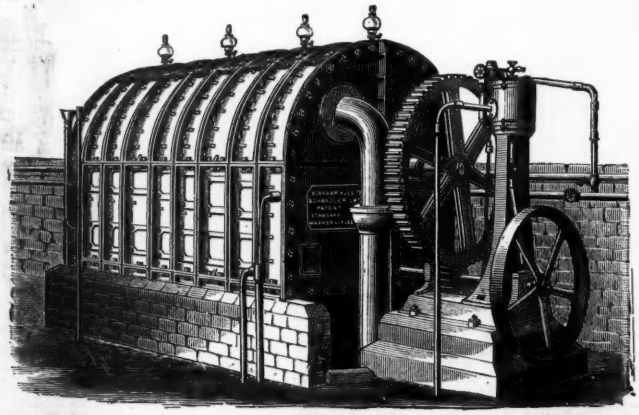
JOHANNESBURG: Commissioner Street.
NEWCASTLE: St. Nicholas Buildings.
SYDNEY: Hay Street.
GENOA: 9, Via S. Ugo.
MANCHESTER: St. Mary's Gate.
MELBOURNE: Collins Street.
BILBAO: Gran Via 52.

Telegrams: "TANGYES BIRMINGHAM."

No. 71 E.

KIRKHAM, HULETT, & CHANDLER'S

[SIDNEY HERSEY, Managing Director.] (LIMITED) [J. CHANDLER Engineer.]

NEW  PATENT

"STANDARD" WASHER-SCRUBBER.

KIRKHAM, HULETT, & CHANDLER, Limited, have pleasure in drawing the attention of Gas Engineers and others interested in the question of the extraction of ammonia and other impurities from Coal Gas to their new Patent "Standard" Washer-Scrubbers, of which 44 are at work and in course of construction.

The original "Standard" Washer-Scrubber (of which 368, equal to a daily capacity of 318,560,000 cubic feet of gas, have been supplied) was admittedly the best machine in the market for the purpose for which it was designed; and the experience gained by the Company during the past nine years has resulted in the production of an improvement on the original patent which has been applied to **23** old pattern machines, and may be briefly described as follows:—

In place of the indented iron sheets made up in segments, and technically called "Bundles," the washing surfaces are now constructed of wooden laths kept in position by being passed through slotted iron sheets, and then butting on to plain sheets, bolted together.

Order just received from the Paris Gas Company for Two Patent "Standard" Washer-Scrubbers, each for 3,000,000 cubic feet of Gas per 24 hours.

THE ADVANTAGES OF THIS SYSTEM ARE:

(1) The Driving-Shaft of the Washer-Scrubber is relieved of five-sixths of the weight (the weight of the Wooden bundles being only one-sixth of those in Iron).

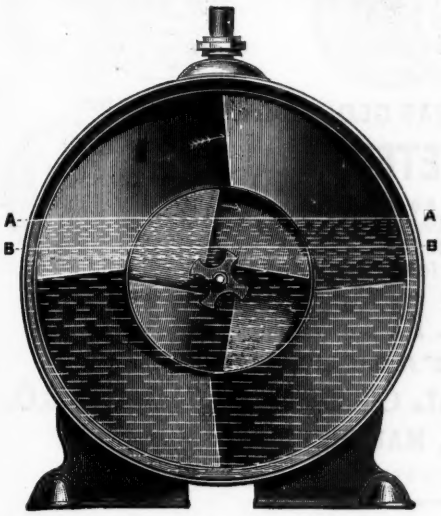
(2) The weight in motion is only one-sixth of that in the original "Standard" Washer-Scubbers.

(3) The driving power required, and "wear and tear" are enormously reduced.

(4) The washing surfaces keep perfectly clean and free from deposit from end to end of the machine.

ADDRESS: 3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

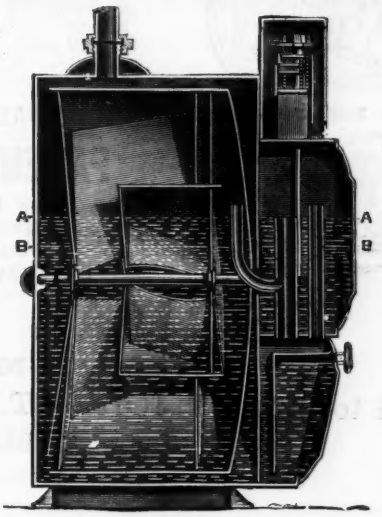
THE WARNER AND COWAN METER.



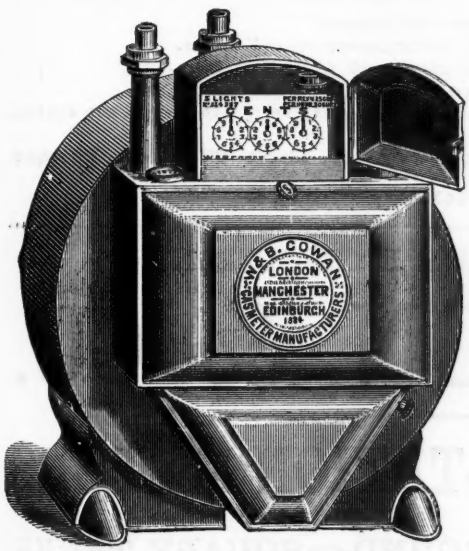
A A, High-Water Line.

B B, Low-Water Line.

Drum in Case. Hollow Cover removed.



Sectional Side View of Meter.



Elevation showing Tin Case Meter.

Elevation showing Cast-Iron Case Meter.

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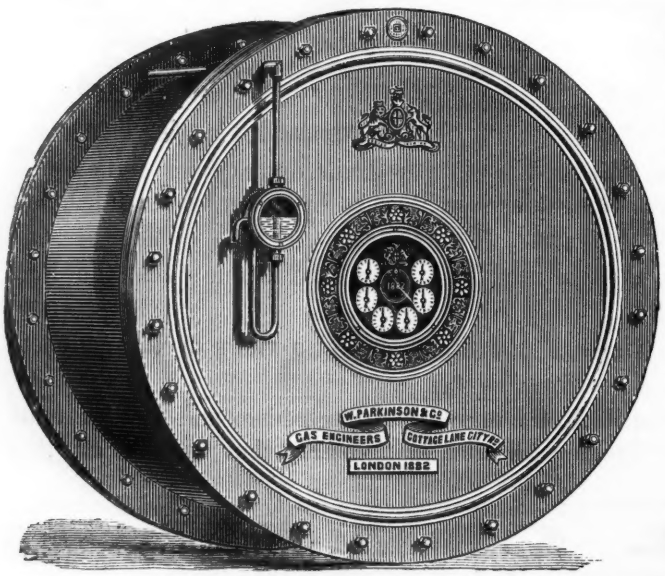

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[See also Advt., p. 649.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 6, 1891.

The Report and Accounts of the Commercial Gas Company.

THE report of the Directors and the statement of accounts relating to the past half-year's working of the Commercial Gas Company have been issued; and the ordinary general meeting of proprietors will be held on Friday. This is a little late for the Company, seeing that under their Act the meeting might have been held last Friday; and the Directors always prefer to call the shareholders together at the earliest moment permitted by law. But it so happened that the London County Council took a two-months' holiday at the beginning of August, and did not assemble again to formally receive the Company's accounts in time for a shareholders' meeting earlier than the 9th inst. According to the Directors' report, the revenue account shows a net profit for the half year of £27,919; making, with £623 received for interest, £28,542. Adding to this the amount brought forward from previous half years, there is a total balance of £84,559, out of which £2925 has to be first deducted for interest on debenture stock; thus leaving to the credit of the net revenue account a balance of £81,634, of which, having regard to the price of gas and the sliding scale, £46,500 is available for dividend, less £4 forfeited by way of penalties for deficiencies in illuminating power. The Directors refer to these forfeitures as having been incurred on account of "alleged" deficiencies which happened in January last. It is doubtless irritating to be compelled to advertise these fines in the report; but there is nothing to be gained by calling the deficiencies in respect of which they were levied by such a term as "alleged," which is only proper for use in connection with unproved offences in general. The law of England has no penalties for merely alleged delinquencies; and whatever the Commercial Gas Company have suffered, in common with their neighbours, on this account, has been for defects proved according to the legal procedure in such cases made and provided. It is useless to cavil at what is past remedy. If the Commercial Directors regard the law of gas testing as unfair, they must set about endeavouring to amend it. To return to the subject of the half-year's profit, it will be seen, on comparing the present accounts with those relating to the corresponding period of last year, that the general effect has been to reduce the undivided balance from £108,848 [to the stated amount of £81,634, or a diminution of £27,214, which nearly approximates to the amount of profit actually made on the working of the concern. The usual dividends after the rate of 13¾ and 10¾ per cent. are to be recommended; and a balance of £36,830 will remain to be carried forward. Notwithstanding this shrinkage of resources, there is no mention of any intended increase in the price of gas—a step which both the other Metropolitan Companies have had to take. It will doubtless be the strenuous endeavour of the Board to preserve this advantage over their neighbours, if it can possibly be done. This is a point upon which the remarks of the Chairman (Mr. J. Blacket Gill) will be awaited with peculiar interest; because it will be for him to declare how the Company stand with regard to their future coal supplies. It appears from the revenue account that the Company spent last half year for coals £87,749, which is an advance of £26,816 upon the corresponding half of 1890; while the carbonizing wages cost them £20,126, as against £17,131, or a rise of £2995. For this they carbonized 112,994 tons of coal, as against 99,683 tons in the first half of 1890. The coals therefore cost 15s. 6·36d. per ton, and the wages 3s. 6·72d., per ton, as against 12s. 2·65d. and 3s. 5·18d. a year ago. The Directors succeeded in buying their coal on considerably better terms than their greater neighbours; but their labour costs them even more than the Chartered Company pay. And apparently the cost of labour is on the increase—as is usually the case where the Union prevails. It will be noticed also that the Company carbonize a heavy percentage of cannel, and do not appear to have followed the lead of others in the matter of carburetting their gas with oil or spirit. With regard to the other charges upon gas making, increases are also to be remarked; so that the total cost of gas manufacture has risen from £96,536 to £129,136. The quantity of gas accounted for has risen from 947,774,000 to 1,030,437,000 cubic feet, giving the substantial increase of 8·72 per cent. The manufacturing expenses have increased by 33·7 per cent.; so that unless a change of some kind supervenes, the price of gas must go up before long. Certain minor economics have been effected; but the final result is that it cost the Company £149,911 to earn £177,830. There is consequently plenty for the Chairman to talk about next Friday; and if Mr. H. E. Jones, the Engineer and General Manager, should address the meeting, as he generally does in a highly interesting manner, he will not be "gravelled for lack of matter."

Mr. Denny Lane's Scheme.

IN another column will be found a reproduction of an article which originally appeared in the *Electrician* on the subject of the proposed action of the Cork Gas Company with reference to the supply of electric light, which has already been commented upon in these columns. The project in question has taken the definite shape of a plan devised by the Secretary of the Company (Mr. Denny Lane)

for distributing electricity from scattered stations worked by gas-engines; and we have no hesitation in agreeing with our electrical contemporary in admitting that such a scheme is most interesting to contemplate. Moreover, we know, even better than our friends of the electrical persuasion, that Mr. Denny Lane is just the man to handle such a project in the proper way. There are, indeed, so many points in regard to which our judgment coincides with the opinions expressed by the *Electrician* with respect to this proposal, that it will save time and avoid repetition of argument if we declare at once that we endorse the whole of the article, both in sentiment and also as a piece of technical reasoning. We should like to see the scheme tried; but we hold that Cork is not a favourable place for the experiment, and would much rather see it done by a Committee of a Corporation like that of Glasgow, or by an independent Company, than by a Gas Company. The *Electrician*, on the other hand, would prefer that a Gas Company tried the experiment, which means that neither of us thinks there is likely to be any profit in it. It is perfectly true that, within a radius covered by a gas undertaking, transmission of power by the gas-mains is more economical than conveying by wire energy in the form of electricity; but the question of fuel, or the cost of developing a unit of electricity at any given station, is only one factor in the whole cost of carrying on an electric lighting installation. Can we express the problem of profitable electric lighting in these terms: "At what cost must fuel "be charged to a certain station in order that the plant "shall earn 5 per cent.?" If we could state the question in this way, it would only remain to compare gas with steam power in the particular case to ascertain which source of power would be preferable. But the problem cannot be so put; for, as a matter of fact, there are central lighting stations in existence which could not earn a dividend if they could get their coal for nothing. The incidence of the load, and other considerations mentioned and implied by the *Electrician*, have in reality far more to do with deciding the question of the success or failure, in the commercial sense, of a central station electric lighting venture, than any point of mere power conveyance, which is, after all, a technical detail.

The North of England Gas Managers.

THE members of the North of England Gas Managers' Association met on Saturday at South Shields, under the presidency of Mr. R. Wallis, J.P., the much-respected Chairman of the South Shields Gas Company. The departure from custom signalized by the selection of a President from outside the ranks of the profession of gas engineering, was in this case a concession not open to objection. Mr. Wallis acquitted himself of his unwonted duties to the general satisfaction of the assembly; showing himself in all respects a fit representative of one of the most genial Gas Companies—if such a term can be applied to a corporation—in all England. In honour of the unique occasion, the South Shields Gas Company were hosts of the Association for the day. It is hardly necessary to say that the gathering, under these conditions, was a very enjoyable and highly successful one. The technical part of the transactions was provided by Mr. L. H. Armour's paper upon the prevention of stoppages in ascension-pipes, which contained a suggestion derived from experience with coke-ovens, modified to suit the requirements of gas manufacture. As might be supposed, the paper evoked a considerable amount of discussion. We give a report of the proceedings in another column.

A Specimen of Ohio Gas Politics.

A CURIOUS story of municipal gas control comes to us from the City of Cleveland, Ohio, where until a recent period the various semi-competing Companies sold gas at the reasonable rate, for the United States, of $1 per 1000 cubic feet. The idea of "dollar gas" is in many parts of the States held up as a boon which is rather to be dreamt of than hoped for; and therefore it may naturally be supposed that, having attained this figure as the selling price for gas reputed to be of 19-candle power, the Cleveland Gas Companies thought themselves safe from "piracy." In the course of time, however, Cleveland became subject to a change of local government, which is a serious matter for the Gas Company of any American town where such an event may happen, because the new comers commonly look round for some means of recouping themselves for the trouble of assuming the command of the affairs of their city, and the Gas Companies, being usually prosperous, are always the first to attract attention. Remembering that the property of nearly every Gas Company in the Union is practically at the mercy of some half-dozen petty politicians who constitute a Board of Works, a Board of Aldermen, or some such body, and who usually alternate their periods of municipal administration with spells of "saloon" keeping or some other occupation equally agreeable to ward politicians temporarily "on the "shelf," the marvel is that American gas supply is so good and cheap as it is. For, with rare exceptions, municipal politics throughout the United States constitute a game at which only a certain stamp of citizen condescends to play; and he does so mainly because he knows how to make it pay, and also because he does not like work. In the example of Cleveland, we are not told what negotiations of individual members of the new local government with the Gas Companies immediately followed the accession of the former to office; but we are informed that, after a few secret meetings, the new City Council passed an ordinance to the effect that thenceforward gas was to be sold within the city limits at the price of 60c. per 1000 cubic feet. Then the Companies bestirred themselves, and, taking advantage of some informality in the proceedings of the Council, procured the quashing of the order. Not to be daunted, the city authorities passed another ordinance for holding an inquiry into the practicability of reducing the price of gas to the figure named; and after a form of investigation had been gone through, the Council adopted a resolution accepting an affirmative report from the Board of Inquiry, and made a fresh order to this effect. The qusetion now is, What can the Companies do? We do not observe that they produced their accounts to the Board of Inquiry, and submitted to a verdict on the merits; and so it is quite possible that they may follow the recent example of the Brooklyn Companies, and pocket the affront. In this event, we shall shift our sympathies, and believe that the City Council know what they are about. If the ordinance is an act of tyranny, unwarranted by the facts, the Companies have the remedy in their own hands by simply discontinuing to supply gas until the Council come to their senses. On the whole, however, it would appear that this incident supplies another piece of evidence to show that Ohio wants a Gas Commission.

Eight-Hourism and Union Management.

SOME curious points of Trade Union management have been brought into prominence in connection with the strike of the Carron and Hermitage wharf labourers. The so-called strike is virtually over, so far as the employers' business is capable of being affected thereby; for the places of the strikers have been filled by new hands who are glad enough to work upon terms which the Union leaders compelled their dupes to refuse. What is more to the purpose, the new hands are engaged permanently, and therefore have a different *status* from that which made the old ones docile slaves to their self-appointed leaders. It has transpired that the employers offered, through the Union leaders, permanent work to their old hands; but, for their own ends, these go-betweens thought fit to keep the men in ignorance of the fact that any such offer had been made. The statement is definitely made in *The Times* correspondent's report of the strike, that "three of "the sometime workmen at the Carron Wharf, being leading "men, had an interview with Mr. Jardine lately; it was "at that interview that they learned for the first time that "the Carron Company had been desirous of offering them "permanent employment." If these men spoke the truth, their testimony lends the strongest support to the position taken up by those employers who have consistently refused to recognize Union officials as fit intermediaries between themselves and their men. It is easy to see that the Union leaders find it contrary to their interest for their supporters to be removed from the condition of casual hands (never knowing what their week's earnings might be), to that of regular labourers for wages calculated by the week, work or play. At the same time, it is worse tyranny than anything they have ever been able to allege against the employers, that they should take it upon themselves to keep their supporters in ignorance of the offer of weekly engagements. Again, there was a point in respect of which the Carron Company agreed with Mr. Tom Mann. Mr. Clem Edwards, and other Union leaders, as representing the men. Notwithstanding this, however, the

men refused to go to work. So we are presented with this striking picture of the "solidarity" of the New Unionist leaders and their followers—that the leaders deceive the men, and the men decline to ratify the action of the leaders. It cannot much be wondered at, after this, that employers who have all along preferred to deal directly with their own men should be confirmed in their policy in this regard.

It is hardly necessary to say that not a sound of all this is allowed to awake an echo in Tom Mann's Journal, the *Trade Unionist*. He prefers to amuse his supporters with graphic reports of the unfurling of new banners, and the ravings of the London stock company of Social Democratic orators at Sunday mass meetings. To read the statements emanating from Unionist sources as to the way in which the other Unions, one and all, have passed resolutions in support of the Dockers on strike, one would imagine that material assistance is being poured in to help the strikers, and that the wharfingers' business was being paralyzed by the abstention of whole classes of labourers without whom the shipping trade could not be carried on for a day. The awkward facts that the wharfingers are doing their accustomed business as though nothing had happened, and that the sympathizing resolutions are not accompanied by solid help, are judiciously omitted from these reports.

As was to have been expected, Mr. Tom Mann has essayed to reply to *The Times*' strictures upon the Eight-Hour Movement, quoted in our last issue. He only tries to turn off the criticism by a cumbrous attempt at making fun of *The Times* writer, in a manner that recalls the old lawyer's instruction to counsel: "No case; abuse the "other side's attorney." The position taken up by *The Times* upon this question seems to us to be impregnable. If the average working day of a whole community can be restricted (say) from nine or ten hours to eight hours, by a stroke of the pen, without affecting the sum of the wealth of the community, or damaging a single individual, why stop there? Why not go the whole length of abolishing labour *in toto*, and thus make everybody happy at once? Will Mr. Mann or somebody on his side kindly answer this question without attempting to be funny over it? Mr. H. M. Hyndman has endeavoured to bolster up the Eight-Hour delusion by taking possession of it in the name of Social Democracy; but as he mixes it up with the general notions on the subject of "Collec-"tivism," and so forth, which he has been airing on all suitable opportunities for years, it is difficult to follow his arguments. Moreover, it is doubtful if Mr. Hyndman could collect a handful of followers to support his way of treating the subject. Socialism one can understand—at least, in part; and Competition we have actually with us. But how the two forces can have conjoined for the production of the idea of the Eight-Hour Day is, and must remain, a mystery.

Death of Mr. C. Bird.—We regret to announce that Mr. Charles Bird died on Friday last, at his residence at the gas-works, Rochester, at the age of 76 years. He had been for no less than 51 years employed by the Rochester Gas Company as Outdoor Superintendent, and discharged his duties till his last illness.

The Pulsometer Engineering Company, Limited, in an illustrated pamphlet of which we have received a copy, show how by means of their appliances, manufacturers may obtain pure water for the purposes of their business without incurring heavy expense. It is well known that no other than rain water should be used in steam-boilers without being first filtered or softened, or both, owing to the production of scale which results; necessitating increased outlay for fuel and expense for removing the incrustation. It is obvious that some clarifying process should be applied to water used for steam-raising purposes; and when this can be done at a very trifling cost, the appliances by which it can be accomplished should commend themselves to notice. Attention may therefore be directed to those manufactured by the above-named Company. In their "Thames" and "Torrent" filters, the materials employed are sponge and ganular material, which are easily cleansed by the simple operations of squeezing or injecting air. In the "Vice-Versâ" filter, filtration is effected by bags—the process going on from the outside to the inside of the bag, and leaving the lime from the water in a convenient position for being washed off. A large installation of "Torrent" filters, capable of dealing with 1,500,000 to 2,300,000 gallons of water per diem, has lately been completed by the Company for a foreign water-works. The water before treatment is very turbid; but the effluent is quite bright, and in all respects suitable for drinking purposes. The Pulsometer Company's filters may be recommended for economy of space, of initial outlay for installation, and of subsequent working.

WATER AND SANITARY AFFAIRS.

The London County Council appears to be in a state of tribulation. The Chairman and the Vice-Chairman are about to resign their posts, for reasons which are none of the clearest. So also Captain Shaw throws up his appointment as the Chief Officer of the Metropolitan Fire Brigade; and everybody remains in the dark as to any particular cause for what appears to be a premature retirement from the public service. Sir Thomas Farrer, in a letter to *The Times*, disclaims the idea that there is any feud between himself and his colleagues; but, on the other hand, he quarrels all round with the Government, with "Society," and "the Tory Press." Avowedly Sir Thomas disagrees likewise with *The Times*, which is not exactly "Tory." Scarcely anything seems right for the County Council. Somebody says it is wonderfully popular at the East-end. We should hardly have thought it, considering the case of the Blackwall Tunnel. But if we want to see the very acme of dissatisfaction as experienced within the circle of the Council, we have only to read the report of the Special Committee on Water Supply, bearing the date of the 22nd ult., and signed by the Chairman of the Committee, Sir T. Farrer, who is doubtless the author of the entire production, the principal portion of which is reproduced elsewhere. It is a doleful document, comprising a lamentation over a "lost session," and a complaint that the Council has been badly treated by the Government, as well as placed in a false position by Sir Matthew White Ridley's Committee. As for the Water Companies, their great sin consists in their silence. They say nothing, which is pre-eminently provoking. There is no knowing what mines they are preparing, wherewith to blow up the Council at a crisis. In 1880 the Companies did not produce any witnesses. Of course there was no need for them to do so. At least that is the opinion of Sir T. Farrer, who thinks Mr. E. J. Smith said enough. In 1890 the Companies declined to give evidence to the Committee of the City Corporation; and "they adopted "a similar line when applied to by the Council." The Select Committee of last session had power to make the Companies speak out; "but," says the report, "the Com-"mittee stopped the inquiry before hearing the evidence "of the Companies." This procedure is described as an "advantage" bestowed on the latter, who heard the case of their "adversaries," and cross-examined some of the adverse witnesses, without stating their own case, or exposing their own witnesses to attack. We are thus presented with the spectacle of the eight Metropolitan Water Companies maintaining what we suppose must be called "a conspiracy of silence," extending over a period of eleven years. Sir T. Farrer is anxious "that Londoners "should understand" the great difficulties which beset the Council, of which this silence forms an important part. We hope that "Londoners" will indeed "understand" and bear in mind that practically only one side of the Metropolitan Water Question has yet been heard, so far as any public inquiry is concerned. Doubtless there are some "new points" to be brought out. But the Companies, after all, are not artfully silent. Given an impartial and disinterested tribunal, they are prepared to speak. They were ready with evidence to be adduced before Sir Matthew Ridley's Committee. Why that evidence was not produced, is sufficiently shown by Sir T. Farrer's report. If the Select Committee had no time to hear such evidence, the blame—if there be any—does not rest with the Companies.

The report of the Special Committee on Water Supply to which we have thus referred, awaits the consideration of the County Council; but, nevertheless, it is evidently intended as a document representing the views of that body. When the conclusions arrived at by Sir Matthew Ridley's Committee were first published, we remarked that the general purport of the whole was a call for some further inquiry. Sir T. Farrer interprets this as having reference to a "new supply." We do not so narrow the proposals of the Committee. The very first recommendation in the report runs thus: "That powers should be "granted to the London County Council to expend such "further sums as may be reasonably necessary, in order "that they may examine thoroughly for themselves, as "the responsible Municipal Authority of London, the "whole position of the Metropolitan Water Supply, and "come to a conclusion as to the policy which, for financial

"and other reasons, it is desirable to adopt." This leaves the great question of a new supply entirely open, and even admits of its rejection or abandonment. But the notion of such a supply dominates the whole of Sir T. Farrer's ideas on the subject; and he is immensely annoyed to find that, before he can realize this pet conception, he must be prepared to see the Council negotiate for the purchase of the supply which already exists. The Select Committee recommended that the County Council, either alone or partly in conjunction with the Corporation of the City, shall be constituted as the responsible Water Authority for London. But this done, the next step is that the Council "should be required to purchase" the undertakings of the eight Water Companies, "by agree-"ment, or, failing agreement, by arbitration, within a "fixed period." It is this requirement to purchase which, in the opinion of Sir T. Farrer, spoils the whole scheme. That this is not merely his personal view, appears by a passage in the report, in which he says that the Select Committee, in stipulating for the purchase of the existing undertakings by the Council as the Water Authority, "dictate to that body a conclusion which is directly con-"trary to the deliberate policy of the Council as laid "before the Committee by the Council's representatives." In another part we read: "If there was one point on "which the policy of the Council was distinctly expressed, "both in their own resolutions and by the evidence of "their witnesses before the Select Committee, it was that "inquiry into new supply must precede purchase."

Let purchase come when it may, the Council, as represented by Sir T. Farrer and his Committee, objects to arbitration, inasmuch as no arbitrator will take into consideration certain matters which the Council resolutely seeks to introduce. The whole policy of the County Council, as set forth by Sir T. Farrer, is to show that the present supply is unsatisfactory, and that a new one is to be sought—the cost of this new supply to be a deduction from the price of the old. A demand is made that "the Municipal Authorities"—that is to say, the London County Council—shall have sufficient powers "to complete all requisite inquiries, to spend money on "plans, to enter into effectual negotiations, or to bring "Bills before Parliament." The decision of the Select Committee, giving priority to purchase, is declared to be "fatal to the action of the Municipal Authorities;" that is to say, it is fatal to the designs of the London County Council. The Council might act if it would; but it desires power to coerce the Water Companies, and to force them into a sacrifice of their property. To such a policy the Select Committee give no facilities. In approaching the Metropolitan Water Question, the County Council sees difficulties on every hand, and, by the terms of Sir T. Farrer's report, boldly declares itself "unable to "accept the condition" as to purchase. Would the Council talk like this if some other authority were in the field, prepared to act on the lines laid down by the Select Committee? An "immediate purchase on arbitration "terms" is declared to be a proposal which "must be "resisted at all hazards." What are the terms contemplated by the County Council? The price to be paid, we are told, should depend "not merely on past dividends "or on Stock Exchange values, but upon the true value of "the undertakings." One of the rules by which the "true "value" is to be discovered and settled, consists in the ability of the present works "to supply future wants." The capital cost of new works is to be charged against the present undertakings, without any reference to the increased income which the new works are to introduce. The Council is now called upon to express "an early "and decided opinion" upon the question of "compulsory "purchase;" and, after that, something more is to follow. What is to come, we cannot say; but no future report can well exceed the present in the imperious pretensions which it advances. The tone it assumes is really worthy of a Cæsar.

The Managership of the Rochdale Road Gas-Works.—Mr. G. E. Stevenson, M. Inst. C. E., has been appointed Manager of the Rochdale Road Gas-Works of the Manchester Corporation. Mr. Stevenson returned from South America in the spring of this year, after a residence of six years in Buenos Ayres, the capital of the Argentine Republic. We congratulate the Gas Committee of Manchester on the selection they have made; and we wish Mr. Stevenson success in his new sphere of labour.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 635.)

Business in the Stock Exchange was much quieter during the past week; and even the American Market exhibited a lull after its activity. Prices generally have tended downward—partly from reaction, but in a measure owing to the greater stringency in the Money Market. The continued demand for gold has had a marked effect; and although the Bank of England rate was left unchanged last Thursday, an advance next Thursday is regarded as an almost absolute certainty—the only question being whether the rise will be ½ or 1 per cent. Probabilities seem to point rather to the greater rise. The Stock Markets, however, are not unduly depressed; and a not far distant recuperation is likely. Transactions in Gas have been very much restricted, and but few features of interest are apparent. The Electric undertakings continue to attract more notice. Change of quotation in Gas stocks are but few; and they are very slight in degree, with the sole exception of South Metropolitans. There is no change in Gaslights, except that the quotation of the "H" 7 per cent. is drawn in a little closer—a move in the right direction, and one which (as we observed last week) might advantageously be extended to other issues. Gaslight "A" was very moderately dealt in; the opening price—232½—was the best of the week; and the closing bargain was 3 lower. A good average of business was marked in the secured issues; but the prices were not very grand. South Metropolitans were weak. The prices were put down from day to day; but there did not appear to be much stock offered, though a parcel of the "B" was specially let go at 225. The little that was done in Commercials showed a firm tendency. The Company's report and accounts are out at last. It is really extremely inconvenient that one of the Metropolitan gas undertakings should be precluded from dealing in general meeting with the affairs of the first half of the year until they are fairly into the last quarter of it. To discuss in October the ancient history of the preceding January, to rake up the events of the past winter when we are entering upon the new, and to do this weeks and months after the other two Metropolitan Companies' meetings are past and almost forgotten, is a perfect absurdity. Reverting to the accounts themselves, the Company appear to have been hard hit in the cost of coal and labour, as every other gas company has been; and they are about £16,000 short of their dividend. They are, however, exceptionally well situated in point of profit balances and reserve fund, which, even after payment of the full dividend recommended, will amount to nearly 10 per cent. of the entire paid-up capital (both stock and loan). But we should be sorry to see these unduly depleted. The Suburban and Provincial Companies are quite featureless; and among the Foreign undertakings, the only one to vary was Imperial Continental, which has receded one more point. Water is very quiet, and only one or two very slight changes in quotation have occurred.

The daily operations were: The opening on Monday was very quiet, and business remained restricted throughout the day, with no change of price. The course of business on Tuesday was much the same; and quotations did not move. On Wednesday, a single transaction in Gaslight "A" was absolutely all that was done. But South Metropolitan "A" receded 3; and ditto "B," 2. The change in Water prices noted in the list were effected. Thursday was a more active day, especially in Gaslight issues of all descriptions. South Metropolitan "A" fell 1 more. Friday was another very quiet day, hardly anything being touched but Imperial Continental, which fell 1. Saturday was quiet and dull, and South Metropolitan "B" was 1 lower.

ELECTRIC LIGHTING MEMORANDA.

The Apotheosis of the City of London Electric Lighting (Pioneer) Company—The New City Lighting—The Fortunes of the Brush Company—The Financial Press on Electric Lighting Prospects.

At an extraordinary general meeting convened last Wednesday for the purpose, the Lord Mayor presiding, it was agreed to wind up the City of London Electric Lighting (Pioneer) Company, Limited, and to return all the capital to the subscribers with a bonus of 50 per cent. The circumstances of the case are so exceptional that the event now chronicled demands particular attention from all who desire to know how electric lighting enterprise is managed in the City of London in this present age. The Chairman told his audience on Wednesday that the object for which the Company was formed had been realized, and that they had sold their "concern" to the City of London Electric Lighting Company for £75,000, clear of all deductions. He thought this would be regarded by all the shareholders as satisfactory. This was all very well, so far as it went; but the puzzling point is to find out what it was that the Company had to sell for the price named. It will be remembered that, some time last year, the Highway Authority for the City of London succeeded, after much abortive effort, in placing two contracts for supplying electric lighting to a certain area of the City. The contractors were unable to make the financial arrangements necessary for carrying out their engagements, and it looked at one time as if the contracts would never be fulfilled. Then it was that the Lord Mayor was, as he has

admitted, approached with a petition that he would throw the weight of the Mansion House into the scale, and thereby ensure the floating of the undertaking. He yielded to the pressure put upon him, in the supposed interest of the City; and accordingly the Pioneer Company was formed for the sole purpose, as it appeared, of "syndicating" another company which should do the work. The scheme has so far succeeded that the last, or executive Company, has been floated, and the lighting has been started; but the net results of the Lord Mayor's action seems to be that the undertaking has been loaded with £75,000 of unproductive capital outlay, which can only be described as the expenses of promotion. This is all very well, of course, for the promoters; but whether it will turn out to be an altogether satisfactory arrangement in the long run for the Lighting Company is another consideration.

In the meantime, it is to be recorded that the lighting of some of the principal City streets by the electric arc has been resumed in what is designed to be a more permanent style than that of earlier experiments. It must be admitted that the lighting arrangements, as provided for Queen Victoria Street, for example, are a great improvement upon previous attempts. The rough Brush lamps and lanterns, with their suggestions of the unfinished American town streets to which they were first adapted, have given place to neat columns, and lanterns which are elegant in comparison. Instead of the thick moony opal globes, which always obstructed 60 per cent. of the light of the arc, and in foggy weather disappeared altogether, wavy glass breaks up the light, and presents the appearance of having behind it a luminous source of considerable size. On the whole, we are free to concede that the Queen Victoria Street lighting is the best display of the use of arc lamps for this purpose that we have yet seen. Whether it will pay for the doing is another question, and one on which we have no desire to be precipitate in offering an opinion. Time will show.

The Brush Company have had their annual general meeting, and have declared a dividend of 6 per cent. This is reported as having been the second meeting of the kind; but the statement requires some explanation. The present Company is not the notorious old "grandfather Brush" who was so prolific in years gone by, and so grasping in his demands upon his children. That disreputable old character has been buried under a pile of reconstruction arrangements. The organization that persists owns descent from him; but disclaims identity. Like the Edison and Swan Company, it seeks to have as little as possible to do with lighting, and endeavours to employ its money in manufacturing and selling plant. Unfortunately for its proprietors, it does not similarly rejoice in the possession of a monopoly in regard to an essential of electric lighting apparatus. A financial newspaper, in a supposed descriptive head-line prefixed to its report of the proceedings at the general meeting, told its readers that "the Directors aim at Central Stations." This remark is perhaps susceptible of various interpretations; but if it is intended to mean that the Brush Directors wish to establish central station lighting ventures with the Company's own money, it is a ludicrous misstatement of their views. The Directors would not even carry out, upon their own responsibility, the City of London lighting contract they had obtained from the Corporation. They had only one lighting undertaking in the United Kingdom, which is a small affair at Bournemouth; and this they have got rid of to a separate Company. They light Temesvar, in Hungary; and they want to resign the privilege to somebody else. Their only other outlying undertakings are a factory in Vienna, which is not doing any great things, and a business in Australia, as to which the best the Chairman can say is that it may be worth something in a few years' time. And this is described as aiming at central stations! But press notices of electric lighting concerns have always been incomprehensively inspired.

Financial journalism is hardly one of the developments of the Press to which we, in whose generation it has taken separate shape and independent existence, can point with any particular feeling of pride. The line of demarcation between the financial journalist and the blackmailer is seldom very well defined; and even those who regularly purchase some favourite newspaper guide to the Investment Market, and as patiently peruse the articles therein published, can rarely succeed in persuading themselves that this class of matter is essentially different from the vaticinations of the sporting tipsters which our most respectable dailies still think it necessary to publish. Even when the financial journalist is not obviously writing to order, he is as unstable as a weathercock. He vaunts some line of speculation to-day, only to turn round to-morrow, when the line has been proved to lead nowhere, and spend his elegant diction in abuse of those who were foolish enough to lose their money. The condition of the electric lighting interest is an illustration of the absolute futility of financial journalism, regarded as a means of guiding the public to a correct appreciation of the prospects of a particular variety of speculative investment. One day the newspape rssolemnly report that there is no money to be made out of electric lighting; and the next they sagely declare that the fortunes of the electric lighting companies are looking up. They can all now point the moral of the disastrous speculation of eight or nine years ago, and confess how imperfect electric lighting schemes were at that period, and how scandalous was their financial manipulation; but they never said so at the time. Last week, merely because the Brush Company paid 6 per cent., some of these advisers of the public sapiently observed that this fact must be regarded as a proof that "wisely-directed enterprise in electric lighting can be made to realize handsome profits." It may be so; but inasmuch as one swallow does not make a summer, we take leave to wait for better evidence than is supplied by one declaration of dividend from an electrical engineering company, before agreeing that electric lighting enterprise generally is entering upon a period of cloudless prosperity.

GAS ACTS OF 1891.

The Private Bill Legislation of last session affecting gas undertakings was not very heavy. According to custom, we herewith give a summary of the principal provisions of the Gas Bills that have passed into law this year.

The Garw and Ogmore Gas Act incorporates a new Company for supplying with gas the district named in the title, which covers parts of the parishes of Bettws, Ystrad, Llantrissant, Coychurch, and Ynysewdre in Glamorganshire. The capital of the Company is fixed at £20,000, with power to borrow £5000. The gas-works are to be completed within seven years; and the maximum price of gas (which is to be of 16-candle power) is fixed at 5s. per 1000 cubic feet. Interest on consumers' deposit is to be allowed at the rate of 4 per cent. The period of error in case of defective meters is limited to the current quarter. The Ogmore and Garw Local Board have power to purchase the undertaking within seven years, for a price to be agreed upon or settled by arbitration upon the basis of a maximum selling price for gas of 4s. 9d. per 1000 cubic feet, instead of the 5s. fixed by the Act. A clause is inserted in order to provide that if, through any road alterations by the Local Board, the gas-mains should require to be lowered, the cost of such lowering is to be divided equally between the Board and the Company; but if the roads are raised, or the pipes interfered with in any other way by the Board, the whole cost of such alterations as may be necessary is to be borne by the Company. The maximum price asked for in the Bill was 6s. per 1000 cubic feet for 14-candle gas. The Leighton Buzzard Gas Act dissolves, and re-incorporates with statutory powers, a Company formed in 1835 for the supply of gas in the town and parish named in the title. This Company was incorporated in 1857 under the Joint-Stock Companies' Act, 1856. Their capital consisted of £12,106 10s., divided into 455 shares of £21 each, and 243 shares of £10 10s. each; and they owed no money by way of loan. The limits of the statutory Company are the parish of Leighton Buzzard, the hamlet of Heath and Reach, in the county of Bedford, and the parish of Linslade, in Bucks. The capital of the Company is fixed at £27,106 10s., whereof £15,000 is the additional 7 per cent. capital authorized by the Act. The original capital is to be converted into stock. Borrowing powers are conferred to the extent of £3000 in respect of the original, and of one-fourth of the amount of the new capital. The price of 15-candle gas is fixed at the maximum of 5s. per 1000 cubic feet within a radius of one mile from the Leighton market-cross, and 6s. beyond. Four per cent. interest is to be paid upon consumers' deposits; and, subject to the same payment of interest, payment for gas may, in certain cases, be demanded six months in advance. The Company may allow discounts not exceeding 20 per cent. for prompt payment, or for large consumption under special contracts, subject to the obligation to treat all alike. It is provided that if a Local Board should be constituted for the town or parish of Leighton, and should apply to Parliament for an Act, or to the Local Government Board for a Provisional Order, for the purchase of the Company's undertaking, the latter shall not oppose generally, but only for securing their own protection in terms. The Kettering Gas Act incorporates a limited Company formed in 1882, when they also obtained a Provisional Order empowering them to supply gas in the town of Kettering, and defining the capital of the undertaking as being £20,000 of original capital entitled to a 10 per cent. dividend, and £10,000 additional capital entitled to a dividend of 7 per cent., subject to the auction clauses and sliding scale; the standard price of gas being put at 4s. per 1000 cubic feet. The paid-up capital consists of £20,000 of original capital, divided into 800 shares of £25 each, all paid, described as "A" shares, and £6500 of new capital, divided into 260 similar "B" shares—making together £26,500; and there is a loan capital of £7500. The Act limits the district of the Company to the parish of Kettering, whereas the Bill contemplated the inclusion of nine Northamptonshire parishes. The capital is increased to £80,000 in 3200 shares of £25 each, whereof £26,500 is called the old, and £53,500 the additional capital. The prescribed rates of dividend are 10 per cent. upon the original "A" shares, 7 per cent. upon the "B" shares, and 5 per cent. upon the additional capital—all to be issued in £25 shares. The Bill had a scheme for converting the 7 per cent. capital into its equivalent of 10 per cent. The additional capital was to be nominally 10 per cent. also; but this plan did not take effect. Borrowing powers to the extent of one-fourth of the capital are conferred, instead of the one-third asked for in the Bill. Permission is given to form an insurance fund by setting apart for the purpose 1 per cent. on the paid-up capital out of the profits in excess of the dividend, until the total fund

so formed amounts to one-twentieth of the paid-up capital. No borrowed money is to be convertible into share capital. The standard price of 4s. per 1000 cubic feet for the Company's 15-candle gas is retained; but the usual increase or decrease of dividend, in the ratio of 5s. per cent. for 1d. taken off or added to the selling price of gas, is only made to apply to the old capital. For the new 5 per cent. capital, the ratio is corrected to 2s. 6d. per 1d. up or down. Interest at 5 per cent. is to be allowed on consumers' deposits. Subject to the consent of a general meeting, the Company may erect on their own lands dwellings for their workpeople. The pension fund proposed in the Bill was dropped. The Rhyl Gas Act incorporates with statutory powers a limited Company formed in 1869 for the purpose of purchasing the gas-works which were established for the supply of the district in 1848. The share capital of the Company consisted of £20,000, divided into 4000 shares of £5 each, of which 27 were unallotted, but all the rest were allotted and paid up; and they had not borrowed any money on mortgage or debenture. The limits of the statutory Company are such part of the county of Flint as lies within a radius of two miles from the Town Hall of Rhyl and east of the River Clwyd Foryd. The capital is raised to £35,000, whereof £20,000 is the original, and the remainder additional. The original capital is to be divided into £10 shares, and also into such number of £5 shares (to be called half shares) as shall be equal to the number of single shares in the capital or joint stock of the limited Company which at the time of the passing of the Act were held separately, and of the odd shares which will remain after deducting from the number of odd shares held by any old proprietor the number of shares exactly represented by £10 shares in the capital of the Company. It is also provided that, as these odd half shares fall into the same hands, they are to be *ipso facto* consolidated into single £10 shares. The additional capital is to bear a nominal 7 per cent. dividend. An insurance fund of 1 per cent. is sanctioned. Borrowing powers are conferred to the extent of £5000 upon the old capital, and £3750 on the new capital; and debenture stock may be issued. The quorum of general meetings, whether ordinary or extraordinary, is fixed at five shareholders, holding in the aggregate not less than £2000 nominal value in the capital of the Company. Directors may declare interim dividends, and take power to close the transfer register for a period of fourteen days before the declaration of an interim dividend, subject to seven days' advertisement. The standard price for the Company's 15-candle gas is fixed at 4s. per 1000 cubic feet. Cousumers of more than 50,000 cubic feet per quarter are entitled to a discount of 3d. per 1000 feet. The supply of the public lamps is to be measured by actual or average meter indication. Meters are to be provided and fixed by the Company at the expense of the Local Authority; but neither party is to be generally entitled to require a meter to be put to more than one lamp in ten. The Company may, however, supply at their own expense extra meters. Regulators for securing equality of consumption between metered and unmetered lamps are to be provided and maintained by the Local Authority, with right of access by the Company for the purpose of examination and testing. It is also enacted that "the average amount of the indications of all the meters attached to the public lamps under the control of the Local Authority shall be deemed to be the amount consumed by each such lamp." Interest at 4 per cent. is to be paid on consumers' deposits. An agreement for the sale of the undertaking to the Rhyl Commissioners is scheduled in the Act. According to the terms of this agreement, the Commissioners have the right to purchase the property, within twelve months from the passing of the Act, for the sum of £32,000, not including the reserve fund and cash or stores in hand. In view of this arrangement the Company are not to enter into any contract for a longer period than six months without the consent of the Commissioners, nor to spend more than a certain amount of capital on the works. The Commissioners agreed to pay £1400 towards the cost of the Act. The usual clauses are inserted for authorizing the Commissioners to take over and carry on the undertaking in the usual way; including power to borrow money for the general purposes of the business. Several clauses contained in the Bill were dropped.

The Bristol Gas Act enables the Company to change their name from that of the Bristol United Gaslight Company to that of the Bristol Gas Company; and also to convert their authorized 10 per cent. capital of £511,250 into the nominal equivalent of £1,022,500 of 5 per cent. capital. The unissued capital of £67,000 is similarly treated. Power is given to the Company to borrow on debenture stock up to one-fourth of the converted capital, bearing a maximum interest of 4 per cent. All other borrowing powers are extinguished. The illuminating power of the gas is increased by one candle; and permission is given to sell gas in bulk, and to supply gas-fittings. The Filey Water and Gas Act enables the Company to raise £5000 of additional gas capital and also money for paying off a debt of £3776 15s. Power is is taken to supply gas-fittings; and the testing arrangements are defined. It is also made compulsory to pay 5 per cent. interest on deposits. The Stourbridge Gas Act defines and extends the powers of the Company in various particulars, The provisions of the existing Acts relative to the price of gas and the dividends payable by the Company are modified as follows: On the original capital of £15,000, the rate is to be 10 per cent.; on £12,000 authorized in 1866, it is 7½ per cent.; and the additional £50,000 granted in 1879 bears 7 per cent. The standard price is to be 3s. 2d. per 1000 cubic feet, or 1d. less than was asked for in the Bill. There are elaborate provisions with regard to the public lighting arrangements. The street lamps in Stourbridge under the control of the Commissioners are to be supplied by the Company, at their own cost, with properly governed batswing or fishtail burners passing 5 cubic feet of gas per hour; and the gas is to be charged for at stated inclusive rentals. Any time within five years after Jan. 1, 1892, the Stourbridge Improvement Commissioners may purchase the undertaking, either alone or in conjunction with the Rural Sanitary Authority for the neighbouring parish of Old Swinford. It is provided that, in fixing the purchase-money to be paid for the undertaking, any increase of dividend under the sliding scale is not to be taken into account, nor is any premium to be claimed by the Company on any money forming part of their newly-authorized insurance or reserve fund. The quality of the Company's gas is fixed at 15 candles; a certain land purchase which the Company have made is confirmed; and a delimitation agreement they have entered into with the Brierley Hill Gas Company is sanctioned.

The Stourbridge Improvement Commissioners' Act amends and modifies the statutory relations of the Commissioners and the Gas Company, which date from 1855, and were amended in 1866. It also confirms the provisions of the Gas Company's Act in regard to the prospective purchase of the undertaking. All moneys borrowed for this purpose are to be repaid in 40 years. The gas undertaking, after having been acquired by the Commissioners, may during a subsequent period of five years be divided up as among the outlying local authorities, who are in such event to buy gas in bulk from the Commissioners. The Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Act recites that the Corporation and the Partick, &c., Gas Company have been to a certain extent competitive suppliers of gas within the district named. At the time of the framing of the Act, the Company in question had a share capital of £130,000, in 20,000 ordinary £5 shares and 6000 cumulative preference 5½ per cent. shares, all paid up. In addition to this, the Company had a debenture debt of £14,390, had raised £55,100 by debenture stock, and had agreed with certain of their shareholders to issue to them debenture stock to the further amount of £24,900, for the purpose of paying off the debenture debt, and for the general purposes of the Company. It is also recited that, with a view to terminating the competition, the Corporation agreed to purchase the Company's undertaking, including a site and gas-works formerly belonging to the Dalmuir, Kilpatrick, and Bowling Gas Company, Limited, which the Partick and Hillhead Company had themselves acquired, upon the terms of a scheduled agreement. This agreement provides, among other things, that the Corporation should redeem the Company's debenture stock, which they had arranged to effect at a premium of £12,500 upon the par value. The Act accordingly confirms the agreement in question, and defines the limits of Corporation supply as consisting of a "city supply district" and "a supplementary supply district," in the latter of which a differential rate is to prevail. Power is taken to dispose of the Dalmuir works and undertaking, if deemed desirable. The costs of the Act, prior to March 5, 1891, are payable by the Company, and the subsequent costs by the Corporation. The scheduled agreement provides that the price to be paid by the Corporation for the undertaking is £202,500, with extras for, first, the value of the gas passed through the consumers' meters between the date of the survey immediately preceding the date of entry and the date of entry, including the stock of gas on that date; secondly, for all outstanding accounts due to the Company at their face value; thirdly, for all materials and stock-in-trade. The Corporation further agreed to take over all contracts. The Company were to pay their own debts, and stop all legal and parliamentary action which they might have pending against the Corporation.

The Notification of the Metropolitan Gas Referees for the current winter season does not contain any noteworthy alteration of the Instructions for the summer six months (the changes in which were indicated in the JOURNAL for the 7th of April last), beyond the raising of the maximum amount of sulphur allowable to 22 grains per 100 cubic feet of gas—this being the usual limit permitted during the winter.

Testing Steam and Gas Engines.—A course of ten demonstrations on the testing of steam and gas engines, boilers, &c., will be given at the University College, London, under the supervision of Professor Beare, Assoc. M. Inst. C. E., early next year. They form the second of three courses of lectures in the Engineering Department of the College; the other two being on the strength of materials.

Gas as a Freezing Agent.—According to a paragraph which appeared in *The Times* last Wednesday week, Mr. S. P. Sticker, an engineer of Buffalo (N.Y.), claims to have discovered a method of making ice by means of illuminating gas, which, after use, may be returned to the mains without deterioration. By experiments in the works of the Provincial Gas Company at International Bridge, Ontario, he is reported to have produced a temperature of 80° below zero by the use of water and gas only, without chemicals.

NOTES.

Display by the New Caloric Syndicate.

Last Tuesday, a party of technical gentlemen and journalists was invited to inspect an experimental installation of the "Dunn Patent Gas and Air Commingler," at the works of Messrs. H. J. West and Co., in the Southwark Bridge Road. The arrangements were made by the New Caloric Syndicate, Limited, under the supervision of Mr. G. A. Everett. According to the terms of the programme of the proceedings, it is claimed that with this system "gas and air can be so thoroughly united and assimilated as to form a mixture which shall be as permanent as ordinary illuminating gas, and can be as safely stored and conducted through pipes to any distance; that, with this mixture, boilers can be heated without smoke-stack or chimney of any kind, ores smelted, and incandescent light of great brilliancy produced at a cost incomparably less than by any other gaseous or solid fuel." The apparatus exhibited on Tuesday consisted of a set of pumps in which the ordinary coal gas taken from the mains of the South Metropolitan Gas Company was compressed to about ½ lb. per square inch, mixed with air under the same pressure, and burnt with a Bunsen flame in the flue of a 15-horse power Cornish boiler; and it was also used to raise a metallic wire "mantle," similar to that employed in the Lewis system of lighting, to a state of luminous incandescence. The mixture as burnt under the boiler was claimed to be 1 of gas to 12 of air; and, in the incandescent burner, 1 of gas to 20 of air. No sort of quantitative test of the advantages of the system was possible; and those who arranged the exhibition seemed to think they had done all that was necessary to assist in the floating of their Syndicate in displaying their mechanical apparatus for destroying the illuminating power of gas by mixing air with it. What advantage there may be in doing by mechanical means that which a common atmospheric burner does by itself, was not made apparent on this occasion. The impression left on the mind of a gas engineering witness of the public trial of this latest of American inventions, in default of information to the contrary, was that the ordinary Bunsen burner, if it had been invented after, instead of before the Dunn "commingler," would have been esteemed a vast improvement upon it. Further authoritative demonstrations of the existence of some recognizable merit in the Dunn process are needed, if it is not to be classed with "Lawrence automatic gas," "Chamberlain gas," and the other delusions of the same order which reflect no credit on their originators and supporters on either side of the Atlantic.

American Systems of Train Lighting.

In a paper read before the Western Railway Club, Mr. George Gibbs, an American mechanical engineer, investigated the various methods of railway train lighting in use in the United States. He passed in review the use of candles, vegetable oils, mineral oils, ordinary coal gas, carburetted coal gas, rich oil gas, carburetted air, and electric lamps. Of these the only systems which the author esteemed as deserving of study are the electric, the carburetted air, or Frost system, the Pintsch oil gas, and oil-lamps. The last is the system generally used in America; heavy petroleum oil taking the place of the vegetable oil commonly used on English railways. With regard to electric lighting, Mr. Gibbs thinks it may be considered as only adapted at present to special service. It fills a number of the requirements of a perfect light; being cleanly, cool, safe, and a luxury appreciated by the travelling public. Unfortunately, it does not recommend itself so well to the railway engineer; being costly, and needing great attention to details. With respect to the Frost method of carburetting air with gasoline, which is effected by a sort of "sponge-lamp" apparatus, and carburets compressed air (regularity of vaporization being provided for by utilizing the heat of the lamps), Mr. Gibbs acknowledges that the light is good, and the manipulation easy. Moreover, every coach is self-contained. On the other hand, the system is costly to set up and dear in running; and the unavoidable need for handling large quantities of gasoline in connection with it is regarded as an objection. The Pintsch system receives Mr. Gibbs's encomiums as the most feasible and promising attempt in the direction of safety car lighting. It is as safe as any method of lighting by flame can be; and it is cleanly, simple, and cheap in maintenance and running. It is, however, high in first cost, and not universally applicable on account of its dependence on gas-works. The last objection does not apply to main lines and important branches.

A Plea for the Lancashire Boiler.

Writing in the *Electrical Review*, Messrs. W. H. Booth and Frank B. Lea discuss the comparative advantages of different types of steam-boilers—a question which is just now being very much debated by engineers and power users. The writers admit that the locomotive boiler is a rapid and economical steam-raiser; but they point out that, when employed in a stationary plant, it should have more water capacity than when it is liable to be shaken about on a locomotive or in a torpedo boat. To be economical and smokeless with ordinary bituminous fuel, a boiler of this type should have a brick arch and a quick draught. With water-tube boilers of the type now usually constructed, with sloping tubes, there appears no reason to doubt the fair circulation of their contained water, nor the dryness of the steam they produce when the steam-drum is not too full of water. It is declared, however, that the water-tube boiler has the serious disadvantage of being a smoke producer; and its considerable employment in the United States may be traced to the fact that it has been so much used with smokeless anthracite fuel. The reason for the water-tube boiler smoking with bituminous fuel is that the products of combustion and gas distillation rise straight from the surface of the grate, where they are produced, directly among the water-tubes above, where they are cooled down before combustion could be completed, even if the conditions for perfect combustion were present, which is not the case. The perfect combustion of bituminous coal requires four main conditions—that is to say: (1) The admission of fresh air above the fire surface, over and beyond that passing through the fire by the grate; (2) the thorough mixture of this fresh air with the evolved hydrogen gases of the coal; (3) a temperature usually understood not to fall below a minimum of 1000° Fahr.; and (4) a certain free unimpeded space in which combustion may complete itself after ignition. In the Lancashire boiler, these conditions are fulfilled. When the draught is sufficient to draw in the necessary air, the Lancashire boiler may be made smokeless; but it should contain no water-tubes near the bridges. Indeed, Messrs. Booth and Lea are inclined to question the utility of cross-tubes in the Lancashire boiler. They protest against allowing the Lancashire boiler to go out of fashion, and recommend, as the best conditions for usual practice, boilers of 7½ or 8 feet in internal diameter, and about four diameters long. The grate area should be 36 square feet for a 7½-feet boiler, or 40 feet for the 8-feet size. The consumption of coal will range from 15 to 25 lbs. per square foot of grate surface per hour. About 21 lbs. is a comfortable rate for constant work, which implies a consumption of 840 lbs. of coal per hour in the 8-feet size boiler; and, with a fairly good compound condensing engine, this will serve to yield 480 indicated horse power.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART I.—THEORY.

(*Continued from p.* 573.)

For reasons which will be suggested by what has gone before, and for other causes which need not be investigated further, it has therefore happened that while the literature of gas engineering is full of references to a most exact and refined photometry, it is almost a blank upon the subject of illumination. Gas engineering writers have, by common consent, treated the distribution of lights without reference to any formal data of illumination. The question of street lighting, for instance, has usually been dealt with by such authorities solely with regard to the exigencies of contracts with local authorities; and the only statement in the newest edition of a deservedly popular gas managers' technical guide-book which bears upon the subject of the lighting of interiors, is the rule-of-thumb direction to find the number of burners required for illuminating a floor space by dividing the floor area in square feet by 50 for ordinary gas, and by 70 for cannel gas, to "give the number of flat-flame burners required for effective lighting." This is a fair indication of the hap-hazard way (using the term in no invidious sense) in which the subject of lighting has been treated, when it has been touched upon at all, by gas engineers. Nor can it be said that this neglect has lacked its Nemesis; for we commonly see now that the first argument employed by electricians to demonstrate the superiority of electric lighting over gas in any particular case, is based upon what is put forward as a scientific comparison between the amount of illuminating effect obtainable from the rival systems. To take the meanest estimate of the duty of gas-lamps, and to multiply the nominal effectiveness of electric lights fourfold, is the commonest trick of electrical speculators; but, unconscionable as these comparisons are, when the imaginary data are fixed by one party, they are not without some use, if only as a warning of the delusiveness of the idea of illuminating power when forced into a service for which it was never designed.

For instruction in the subject of lighting, we must therefore look outside gas engineering, and open our minds to something beyond the convention of "illuminating power." The only thing we need take from gas engineering to help us in this study is the standard candle, which is generally accepted as the British unit of light. Since it is lighting that is to be studied, and not light-sources, we have no more to do with the standard sperm candle than to take it as a fact. It is the simplest and most intelligible artificial source of light, which, as we know from the text-books, travels from its source in straight lines in every direction; so that, if the medium is transparent, the share of illumination received by any surface exposed to this radiation varies according to the square of the distance of such surface from the source of the light.

The foregoing is Kepler's law. But it implies two assumptions—first, that there is no absorption of the light by the medium through which it radiates; and, secondly, that the source of the light is a point. When the light-source is of appreciable area, and the atmosphere through which it has to produce its effect is

capable of absorbing or refracting it, the law becomes subject to corrections difficult to determine, and practically impossible to apply. Leaving for the moment the subject of these corrections, the study of illumination requires further equipment than the datum of the standard candle, and Kepler's law of the relation between intensity of radiation and distance. The next point considered by authoritative writers on the subject is the angle which the illuminated surface presents to the source of light. The greatest effect is produced when the surface is at a right angle to the rays, regarded as proceeding from a point, and the effect is diminished in the proportion of the sine of the angle formed by the surface with the direction of the rays.

These are the fundamental relations taught in connection with researches into the phenomena of illumination. The lighting of objects is not by any means a simple effect, nor is it possible to state in simple terms a comprehensive method of measuring it. We now proceed to summarize the teaching of the text-books which deal with lighting as a branch of optics.

Dr. Lardner is one of the clearest and most informing of writers upon natural science. In his "Treatise upon Optics," first published in 1856, this author states Kepler's law as follows: "The intensity of light which issues from a luminous point diminishes in the same proportion as the square of the distance from such point increases." And in expounding the consequences of this general law, Dr. Lardner says: "Since, then, the intensity of the light proceeding from each luminous point is inversely as the square of the distance from such point, it follows that the intensity of the light proceeding from any luminary will depend conjointly on, first, the number of luminous points upon the luminary, or, what is the same, the magnitude of the luminous surface; secondly, on the intensity of the light of each luminous point composing such surface; and, thirdly, upon the distance from the luminary at which the illuminated object is placed. The absolute brilliancy of each luminous point composing any luninous object is called the absolute intensity of its light. Let this be expressed by I. Let the number of luminous points composing it, or the magnitude of its luminous surface, be expressed by S, and let the distance of the illuminated object from the luminary be expressed by D. The brilliancy of illumination will then be expressed by—

$$B = \frac{I \times S}{D^2}$$

In other words, the brilliancy of the illumination is proportional to the absolute intensity of the luminary multiplied by the magnitude of its illuminating surface, and divided by the square of the distance of the illuminated object from it."

The case of oblique illumination is thus explained: Let X Y (fig. 1) be a pencil of rays, taken to be parallel; and let A B be a surface on which these rays fall. Let this surface be supposed to be capable of being turned upon the point A as a centre, so as to assume different obliquities in relation to the rays. If it were in the position A B, at right angles to the direction of the rays, it would receive upon it all the rays included between the lines A X and B Y. If it is shifted to the position A B^1, it will receive upon it only the rays included between the lines A X and $B^1 Y^1$. If it is in the position A B^2, it will receive upon it only the rays included between the lines A X and $B^2 Y^2$. Again, if it is in the position A B^3, it will receive upon it only the rays which are included between the lines A X and $B^3 Y^3$. Thus it is quite apparent that, as the obliquity of the surface upon which the rays fall to the direction of the rays is increased, the number of rays incident upon such surface will be diminished, and that this diminution will be in the proportion of the distances $B^1 Z^1$, $B^2 Z^2$, $B^3 Z^3$, &c. These lines represent what is called in geometry the sines of the angles formed by the surfaces B^1 A, B^2 A, &c., with the direction of the rays. It follows, therefore, that the intensity of the illumination produced upon a given surface by a given pencil of rays will diminish in the same proportion as the sine of the angle of obliquity of such surface to the direction of the rays is diminished; that the illumination is greatest when the surface is at right angles to the rays; and that it gradually diminishes until the surface is in the direction of the rays, when it ceases altogether to be illuminated. This is the simplest way of stating the facts.

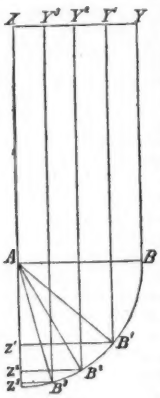


Fig. 1.

The lighting of material objects, while it depends in degree upon the operation of the foregoing laws with regard to the source of the light, whatever it may be, is a complex phenomenon, due to what is called the *irregular* reflection of the incident light from their surfaces. This light is not only the direct radiation from the luminous source, but is also supplemented by the secondary radiation from the absorbent particles of the semi-transparent medium (the atmosphere) through which the primary light is, so to speak, strained. As we have no experience of a perfectly transparent medium for transmitting luminous rays, so also we have no knowledge of a non-reflecting material surface. What is called "irregular" reflection is consequently one of the properties of light which is most essential to the efficiency of vision. Without it, light would be either absorbed by the surfaces that receive it, or it would be reflected regularly—*i.e.*, in straight lines. If the light which proceeds from luminous objects, natural or artificial, were absorbed by the surfaces of objects not luminous, then the only visible objects in the universe would be the sun, the stars, and artificial lights. "These luminaries would, however, render nothing luminous but themselves" (*Lardner*). If the light radiated from luminous sources were only to be *regularly* reflected from the surfaces of non-luminous objects, these latter would still be invisible. They would present the effect of so many mirrors, in which the images of the luminous objects only could be seen. Thus, in the daytime the image of the sun would be reflected from the surface of all natural objects, as if these were made of looking-glass; but the objects themselves would be invisible. A room lighted artificially would reflect the images of the flames from the walls and all other objects, as if these were specula; and all that would be visible would be the multiplied reflections of the artificial lights.

It is by irregular reflection alone that the forms and qualities of objects are made visible to us. This is not effected from the first irregular reflection of light proceeding from luminous sources. "Objects illuminated and reflecting irregularly the light from their surfaces become themselves, so to speak, secondary luminaries, by which other objects not within the direct influence are enlightened, and thus in their turn reflecting light irregularly from their surfaces, illuminate others, which again perform the same part to another series of objects. Thus light is reverberated from object to object through an infinite series of reflections, so as to render innumerable objects visible which are altogether removed from the direct influence of any natural or artificial source of light." The atmosphere takes a part in this general lighting by irregular reflection. Dr. Lardner was, indeed, disposed to exaggerate the use of the atmosphere in diffusing light. What he said was that every particle of air subjected to the direct radience of light becomes itself a luminous centre, from which light radiates in every direction. Apart from the initial difficulty of realizing what is meant by the term "particle of air," it is open to be objected that Dr. Lardner was inclined to ascribe to irregular radiation by the air, much that later authorities have referred to cross radiations of the ether. It is necessary, however, to bear in mind the part played by the atmosphere—in which term may be included all floating dust, fogs, &c.—in relation to lighting. Atmospheric radiation and the irregular reflection from solid bodies are the immediate cause of lighting being diffused and general, instead of sharp and dazzling. Dr. Lardner observes upon this head: "It is the same with artificial lights. A lamp placed in a room illuminates directly all those objects accessible to its rays. These objects reflect irregularly the light incident upon them, and illuminate thus more faintly others which are removed from the direct influence of the lamp; and thus these again reflecting the light illuminate a third series still more faintly, and so on." The difficulty of calculating the amount of this complicated reflection from reflection repeated *ad infinitum* is evident; yet this is the obstacle that stands in the way of those who would convert the term of the illuminating power of a lighting-source into terms of the diffused light obtained from it in any particular locality.

(*To be continued.*)

The Wenham Company have forwarded to us a copy of their revised complete catalogue of lamps, stoves, governors, &c. It is a well-printed quarto book in which the Company's specialities are fully illustrated.

A Caution.—Mr. James Stelfox, the Engineer and Manager of the Belfast Corporation Gas-Works, writes (under date of Sept. 29): "As on several occasions lately, I have become aware that assistance has been sought from gas engineers by a person who has given my name as a reference, will you permit me to say that I have no knowledge of the person in question, and that no one has a right to use my name in this way."

Woking District Gas Company, Limited.—Our readers will see, by the prospectus which appears in our advertisement pages, that a Company has been formed, under the above title, with a capital of £16,000, in £5 shares, and borrowing powers to the extent of one-fourth, for the purpose of supplying gas in Woking and certain contiguous places in Surrey. The necessary authority was obtained by a Provisional Order granted last session, under which the Company are allowed a maximum dividend of 10 per cent. per annum. The works and plant are to be furnished by Messrs. Alfred Williams and Co., of Bankside, according to the plans of Mr. Jabez Church, M. Inst. C. E., the Company's Consulting Engineer; and they will be commenced at once. The locality in which the operations of the Company will be carried on is well known for its salubrity; and therefore its special suitability as a residential district is being more recognized by the public. There seems, therefore, to be a fair prospect of business, especially as a desire has already been expressed by many of the residents and tradesmen to have gas. Companies supplying towns in what may almost be called the neighbourhood of Woking are now paying the full rate of dividend granted to the Woking Company; and there appears no reason why the new venture should not be equally successful. It will be noticed that on the directorate are three gentlemen who are associated with gas undertakings.

TECHNICAL RECORD.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

The Twenty-ninth Half-Yearly Meeting of this Association was held at South Shields last Saturday. There was a large gathering. The members and friends first assembled at the works of the Gas Company, where the Engineer, Mr. W. J. Warner, and his assistant, Mr. Wood, courteously received them, and showed them round. The works were originally constructed for an output of about half a million cubic feet daily; now they are being worked up to a million and a quarter feet per diem. There are 189 retorts, in settings of seven, ranged in two benches—a single and a double; and though the method of firing is that of the old direct furnace, there is a peculiarity in Mr. Warner's setting by which he obtains much of the advantage which others derive from regenerative firing. The works, indeed, become quite interesting when they are understood. For example, the gas is passed, in the first instance, through a vessel of wooden trays—an invention of Mr. Warner's own—which, by the way, was patented in America several years ago as a new method of preventing stoppages in pipes. At these works also, board scrubbers, which were afterwards adopted by Mr. George Livesey, were first introduced; and here Cowan's governors, balanced by a gas chamber, were first set up. The other plant includes two Gwynne and Beale exhausters, two of Parkinson's station meters, and a Feldmann's sulphate plant, capable of producing 10 tons of sulphate a week. Altogether, it may be said, the South Shields Gas-Works (in operation) exemplify, in no ordinary degree, the mastery of mind over matter. Mr. Warner is master of his works, and not they of him.

The business meeting was held in the Company's Board-room at the Offices in Chapter Row. Mr. ROBERT WALLIS, J.P., the President of the Association, who has occupied the position of Chairman of the South Shields Gas Company for more than 30 years, took the chair shortly after noon.

A WELCOME TO THE TOWN.

Mr. Councillor SMITH, in the absence of the Mayor, briefly welcomed the Association to South Shields; remarking that he knew their deliberations were for the advantage of the members and of the public at large. He trusted that from the address of the President, and the paper which would be read and discussed, they would receive a great amount of benefit.

The PRESIDENT, on behalf of the Association, thanked Mr. Smith as the representative of the Mayor and Directors of the Gas Company. He himself, he said, occupied the same dual capacity as Mr. Smith; and he knew very well the interest that was taken in their meeting by both bodies. They considered the visit of the Association as an honour to them.

NEW MEMBER AND ASSOCIATES.

Mr. B. W. Richardson, of Harrogate, was admitted as a member of the Association; and Messrs. L. H. Armour, C. E., of Gateshead, and T. Gibson, of Carlisle, as Associates.

The PRESIDENT then read the following

INAUGURAL ADDRESS.

Gentlemen,—I will not stay to inquire why you have done me the honour to appoint me your President. It is a post more fitly due to gentlemen who, by their scientific and practical abilities, have distinguished themselves by promoting the special interest of your Association—that is, the manufacture and distribution of coal gas.

I am not disposed to question the liberal spirit which prompts the admission amongst you of those who have neither scientific nor practical abilities, but those also who have taken, for a long period, an anxious and active interest in the administration and financial management of this great industry. Gas manufacture has always been a subject of lively interest to me. I am, I believe, not only one of the oldest in years, but one of the oldest in official connection with the gas interest throughout the whole area embraced by your Association—in that respect, gentlemen, an unenviable position. But I accept the position with thankfulness and humility. It is the one, the only one, which has brought me the rich reward of being chosen your President; I have no other qualification. What little science I might once have had, has long ago become obsolete.

I remember well, when Provincial Gas Associations were first contemplated, having long and anxious discussions with one of your present and most active members, about the judiciousness, and probable success, of separating ourselves from the parent society—the great national "Gas Institute." At that time, I argued that "Union is Strength," and advocated no falling away from the parent society. But, gentlemen, from careful observation during all the years that Provincial Associations have been in existence, I am now satisfied that I was wrong. After all, there has been no real separation between the parent tree and the branches. We have a proof of this in the fact that one of our own distinguished members had this year the honour of being President of The Gas Institute.

I will not allude to the trouble and annoyance that befell the parent society a few years ago, further than to express the liveliest satisfaction that the Institute has regained the confidence and goodwill of all right-thinking men, and its old influence over the great interest it represents. The only change that I can see is the abolition of "Innocents Day." Many valuable papers which were designed to be read at the annual meetings of the Institute, were postponed, and lost to the public for want of time. They are now read and discussed at the different Provincial Associations, with credit to their authors and to the dissemination of useful information.

Since the commencement of the present century, what wonderful development of inventive genius we have witnessed! The world, as it were, encircled with an iron girdle; ships (such as our forefathers had no conception of) now plough the pathless deep at the rate of 20 miles an hour—thus annihilating space, extending beyond all conception the trade and commerce of the world, and bringing all nations into kin. Amongst the many other great conceptions of inventive genius the century has produced is the art of manufacturing coal gas—"an art that does mend Nature." It was first publicly introduced on the memorable occasion in our nation's history at the celebration of the Peace of Europe in the year 1802, by Mr. Murdoch—the undoubted promoter of the manufacture of coal gas for public lighting. And I will ask you, gentlemen, to endorse the noble sentiments in the presidential address to the parent society at Carlisle, to lose no time in wiping out the stain (I will not say on the gas interest, but on the nation at large) that no fitting memorial should ever have been erected for a man who has done so much to promote the prosperity, happiness, and comfort of the civilized world.

These are no mere words of rhetoric, gentlemen. The science of coal gas manufacture has dignified labour; it has raised up a class of mechanical engineers and natural philosophers, not to be surpassed in any other art or science; it has added a new direction to the science of chemistry; it has been a fruitful field for the surplus capital of this rich nation; and yet there is no memorial to mark the nation's gratitude to so great a benefactor. Mr. Murdoch had previous to 1802—in 1798—made many private experiments. But the inauguration of public gas lighting dates from the first public exhibition in 1802; though it was not till the year 1810 that the first Act of Parliament was obtained by the London Gaslight and Coke Company, with a capital of £200,000. In the year 1812 they obtained their Charter. In 1816 they had again to apply to Parliament for an increase of capital to the extent of another £200,000. One grave mistake they made, which, I believe, is not an uncommon one at the present day. They laid their mains too small, and had to replace them with larger ones. By this time coal gas had gained the favour and confidence of the public. It had overcome the powerful opposition and interference of private interests; it had overcome the inveterate prejudices of its opponents, and the ungenerous rivalry of the London and Westminster Oil-Gas Company; it at once became a financial success, and has continued so till the present time. Oil gas, on the contrary, although generally established in the year 1817, and incorporated in the name of the London and Westminster Oil-Gas Company, was supported by the leading philosophers of the day—Congreave, Brande, Faraday, Ricardo, &c.—with a capital of half-a-million, and adopted by the incorporated companies in Edinburgh, Liverpool, Manchester, &c. In the laboratory experiments it gave 3½ to 1 in brightness and purity over coal gas; and yet in a few years all the companies came to ruin. We have heard very little about oil gas from that time until we hear that The Gaslight and Coke Company, owing to the high price of coal, are at present supplementing their make of coal gas with a portion of oil gas. It will be interesting to know the results.

From that time (until the electric light threatened to extinguish us), by the rapid and scientific improvement in manufacture, purification, distribution, the utilization of the residuals, and the many other purposes coal gas can be applied to, it has maintained undisputed possession of public favour. I know of no other commercial pursuit that has had such a rapid and successful career. As early as the year 1827, no less than 200 of the large cities and towns in the kingdom were lighted with coal gas—the South Shields Gas Company among the number, as our first Act of Parliament was obtained in 1824; and at the present day, there is not a town of any importance in the kingdom but has its gas company.

The yearly increase in the use of gas throughout the kingdom is enormous; necessitating a yearly increase of capital. As I have mentioned before, the first company that obtained parliamentary powers was The Gaslight and Coke Company. Their capital from 1810 to 1816 was £400,000; their capital is now, in round figures, 12 millions of pounds. It is the largest gas company in the world. By the last parliamentary returns, the capital employed throughout the kingdom is 96 millions. But this is not all. Gas speculation has become a speciality with English capitalists. English coal, English capital, and English engineers of scientific and mechanical ability have established the manufacture of coal gas in the farthest limits of civilization.

This, gentlemen, is our inheritance! We must guard it with all our might and ability. It is true we have not the same chances of distinguishing ourselves as our predecessors. They have brought the science of gas manufacture to nearly perfection. But there is no finality. There are giants in these days, whom it would be invidious to particularize; and who can tell what further wonderful discoveries may be made in the distillation of coal?

In matters of detail, I would commend to your attention the subjects of mechanical stoking, the amalgamation of companies—both for the manufacture of gas and the treatment of residuals by the companies themselves—the best methods for popularizing and promoting an increased consumption of gas for other than lighting purposes, and the assembling of ourselves together to read and discuss papers on practical subjects. Whether or not there may be any great and startling discoveries for us, in our time, from the high state of working order the industry has been brought to, with careful attention to detail, we ought to be able to hold our own against all comers; to continue to command the confidence and good will of the public, and to maintain the commercial value of the undertakings.

Mr. J. Hepworth (Carlisle) said he thought they should express their opinion as to the admirable address to which they had just listened. He was sure he carried the feeling of everyone with him when he asked them to award a hearty vote of thanks to their President. Whatever Mr. Wallis might have felt as to his being requested to preside over the Association, he could assure him that the members felt it to be a higher honour to them to have had the opportunity of meeting under his presidency. Those of them who had known Mr. Wallis—and some of them had been acquainted with him for many years now—knew how intimately he had been connected with the gas industry of South Shields; and though he had spoken regretfully of his want of knowledge of scientific methods, they all knew that he was one of the first to introduce them for the manufacture of gas, and that the South Shields Gas Company were largely indebted to the ability which he had exercised as Chairman. He might be permitted, as the Past-President of The Gas Institute, to thank Mr. Wallis for the exceedingly kind words he had spoken of that organization, and he trusted that the useful work of the Institute, and of the kindred Associations to which he had referred, might go on and increase. Whatever room there might be for further improvements in the manufacture of gas, nothing would encourage them more to promote these than the words they had just listened to.

Mr. W. Hardie, jun. (Tynemouth), seconded the proposition, which was carried.

The President said he was exceedingly gratified with the way they had thanked him for his very imperfect performance of his duties. He might say that he had very great trepidation in meeting them. He had the greatest respect for everything connected with gas; but the reception they had given him was highly gratifying indeed.

Mr. L. H. Armour (Gateshead) then read the following paper on

A SIMPLE METHOD OF PREVENTING STOPPAGE IN ASCENSION-PIPES OF GAS-WORKS.

In dealing with a well-known problem, it is not possible to avoid references that are familiar to all concerned in the processes of an ordinary gas-works; but I trust also to add thereto certain facts of importance in the working of a gas plant.

The choking of ascension-pipes by the rapid deposit of pitch, is a common mishap in most gas-works. It is generally admitted that the higher the temperature at which the fires are maintained, the greater is the tendency of the pitch to form; while bends, smallness of the diameter of the ascension-pipes, or their nearness to the brickwork of the retort-bench aggravates the case.

Among the attempts to cope with this tendency may be mentioned: (1) The placing of a large piece of coal in the mouthpiece just before shutting the door. (2) The placing of a pannikin of water similarly. (3) The dishing out of the under lip of the mouthpiece, to hold the early condensation of liquor. (4) The trimming of the charge in the retort so that there is the greatest body of coal nearest to the mouthpiece. (5) The forming of an internal annular space round the lower part of the ascension-pipe, to catch the liquors condensed in the early stage, to be evaporated at the later stage. The object in all these appears to be to secure, during the later periods of carbonization, products which usually are driven off early in the process.

A short account of how I was led to what I believe to be not only a sound, but a simple means of preventing the deposit of pitch in ascension-pipes, may be quite as interesting as any line that I could follow. Last summer I was appointed to continue experiments in obtaining residual products from coal in the ordinary process of coking. These experiments had been in hand for some years; but a difficulty which stood in the way of effective work in any direction was the persistent and rapid formation of pitch in the piping used. Briefly, the mode of operation consists in exhausting a portion of the gas evolved in the process of coking by gentle suction through small openings in the oven floor into a hollow under it, from which hollow a horizontal pipe, corresponding to the ascension-pipe of a gas-works, leads into a larger pipe acting as a hydraulic main, whence the gas is drawn through a set of condensers.

A portion of the first pipe, you will note, is under the floor of the oven, and only protected from the heat by a few courses of brickwork. Naturally, the floor becomes highly heated after a few charges have been coked; and as soon as the effluent vapours come in contact with the hot metal pipe, the pitch is deposited thereon and hardened. While the floors were new, and before they had become thoroughly heated, a satisfactory yield of products was obtained; but with the warming up of the floors came the formation of pitch in the piping, and the gas no longer found effective vent in response to the suction.

The oil obtained after the outlet had become obstructed, had an appearance which the men in charge described as "burnt." In order to counteract the evil effects which I believed arose from the very high temperature of the floor, I introduced a small drip or trickle of water into the hollow under the oven floor, and kept it flowing as long as the suction was applied. The effect was immediate. The outlet-pipe no longer took on a deposit of hard pitch; and when I afterwards used ammoniacal liquor, resulting from the process, for the drip in place of ordinary water, the deposits previously formed in the main were softened, and began to flow.

After experience of the effect of a minute quantity of liquor in preventing the formation of pitch in the piping above described, it was an easy inference that the analogous difficulty in the case of gas-works piping would be overcome by the same means. I have the satisfaction of being able to confirm this by the actual application to a setting of retorts at Carlisle, kindly carried out by my friend Mr. Hepworth; while, through the courtesy of Mr. Warner, a specimen fitting has been applied to a retort in his works in South Shields.

I may as well explain that there is no lack of liquor from the gas drawn down from a coke-oven; the quantity sometimes exceeding 40 gallons per ton. So that, adding the drip looked like a needless addition to an already abundant product; but the fact remains as to the invariable effect of the added water. In a set of a dozen ovens, all exhausting into one main and at different stages, the early moist vapour from the charge of one oven seemed to have no effect on the later and drier vapour of its almost completely coked neighbour; and only after introducing the drip was the pitching in the main checked.

The requisite apparatus consists of an overhead tank, which may be kept full from the town water supply by a ball-tap; but the effect of the crude ammoniacal liquor shows its use to be preferable. From this tank a pipe running along the front of the bench carries a tap for each mouthpiece. As the latter is fitted with a sealed inlet, to receive the drip from its tap, it will be obvious that this provides a sight feed, the rate of which is open to instant inspection; and with the set of drip taps all at one level, a look along suffices to show how each is working.

The unmoistened vapours from the coke-ovens not only deposited pitch in the first or outlet pipe, but the other piping was also affected in a similar way. I have already referred to the analogy between the coke-oven piping and that used in a gas-works. This analogy runs also to the behaviour of the tarry products; for where the tendency of pitchy deposit in the ascension-pipes of a retort is greatest, there also clotted and sluggish tar is to be found affecting the seal of the dip-pipes in the hydraulic main, and by adhesion and defective flow in the condensers, reducing their efficiency. As the unequal texture of the condensed tar, in whatever part of the plant it arises, is from the same cause, that which corrects this feature, where it is most strongly marked, will also act advantageously elsewhere. In other words, that which clears the ascension-pipe will also cause the tar condensed in other parts of the plant to flow readily.

Having thus briefly stated the process by which I arrived at this method of using ammoniacal liquor for this purpose, and for which letters patent have been obtained, and having laid before you the evidence of its efficiency, I may conclude by referring to the more obvious results arising therefrom. These are: (1) Prevention of back pressure from stoppage in the ascension-pipes, thereby not only allowing the newly-formed gas free vent, but removing an important cause of the formation of carbon on the inside of the retort. (2) Freedom to use the highest attainable heat without fear of stoppage from pitchy deposit in the ascension-pipe. (3) Less liability of the tar resulting from the use of this appliance to clot in the hydraulic main and elsewhere. These points, with the other relative advantages arising incidentally, will, I trust, commend the device to your favourable consideration.

[Mr. Armour mentioned, in concluding his paper, that anyone who had not seen the little arrangement he had described might witness it in operation at the South Shields Gas-Works.]

Discussion.

Mr. W. Hardie, jun., said he did not rise with the intention of saying much on the important subject before them, but more for the purpose of asking a question. The question of stopped ascension-pipes was one which had been foremost, he might say, for all time. That there were cures for the evil, he thought most of them would admit. But, in the majority of cases, it was found that the cure was worse than the disease; and, besides, they often involved a great amount of expense and trouble. Mr. Armour spoke of using ammoniacal liquor in place of ordinary water; and the question he wished to ask was why he did so. One would quite see that ordinary water would condense in the mouthpieces, and keep them cool; but he did not see what advantage was to be gained by supplying ammoniacal liquor. If Mr. Hepworth or Mr. Warner, who had had this plan in operation, had used ammoniacal liquor, he would like to know what advantage they had gained from so doing. It seemed to

him that they would lose a quantity of ammoniacal liquor, and that before it entered the mouthpiece at all, most of the ammonia would be driven off.

Mr. J. Hepworth did not think he had suffered quite so much as some of his brethren from stoppages of ascension-pipes. But he knew something about them—in fact, too much; and he also knew something about the remedies that had been used to prevent them—in some cases, with very little success. He was not responsible for Mr. Armour's paper being read; but he was responsible for making the experiments at his own works to which Mr. Armour had referred; and if he told them the success, or otherwise, that had followed the use of the arrangement, it might, perhaps, lend some little interest to the paper. The fittings which had been described were exceedingly simple in character, and inexpensive; and unless Mr. Armour placed a royalty on it (of which he as yet knew nothing), the cost of the invention must needs be small. With respect to the efficiency of it, he was bound to say, first of all, that he fitted up the arrangement to one or two ovens; but as he did not work on Sundays, he found that on Mondays there was always some little difficulty in getting the apparatus to operate again. The cessation in the working probably caused the inlet for the water to fill up in some way; but when it was worked continuously, there was no trouble of that kind. There was another slight difficulty; but he thought this lay with himself, and not with Mr. Armour. The seal was sometimes displaced; but on making it a little deeper, it was remedied, even with the stoppage on Sundays. He had no trouble whatever now; and in an ordinary setting, fitted in the usual way, the thing went successfully from month to month, with the effect of preventing all stoppages. He did not think, however, this was a sufficient test to apply, because he was not troubled before with stoppages, although he employed high heats. He had several settings which worked at very high heats—there would be no difficulty in working them off in four hours, though, as a matter of fact, they worked them off in five hours. Until a week or two since, he was repeatedly troubled with stoppages in these at the top; in one setting, he should say no less than eight or ten times in 24 hours. This was a great nuisance, because, whatever good effect he was getting from the high heats, he was suffering a good deal of loss in the stoppages. He accordingly applied Mr. Armour's arrangement to this setting. It had been at work now for nearly a fortnight; and instead of having eight or ten stoppages in 24 hours, he had not had one. There was a little matter that was not perfect. The stoppages at the top had ceased; but there had been one or two slight obstructions just at the point where the gas passed from the retort. He expected, however, that when they had found how much water they needed, they would get over this. The difficulty was not a serious one. By simply putting up a jumper, it was opened; and the retort went on again. It had only happened once or twice in 24 hours; and this in retorts heated up to a very high degree. He had had no experience in the use of ammoniacal liquor; but he should think it might be explained in Mr. Armour's case by his making it at his coke-ovens, where it was very poor and of little value. There was one thing, however—the water was connected directly with the main, and the pressure somewhat varied; whereas, if the water were delivered from a cistern, the last difficulty in making Mr. Armour's method perfect might perhaps be removed. He ought to have mentioned that, in these very highly-heated retorts, the coal used was of a rich character. It was the richest cannel they had; and it was quite possible that, if coal had been used and not cannel, no stoppages would have occurred. Such as there was, had been very slight; and he felt that probably another week's experience would enable him to remedy them.

Mr. J. Hall (Chester-le-Street) said that gas managers, from the start, had had a great deal of trouble from stopped ascension-pipes; and it was a very annoying thing. It was, besides, very difficult sometimes to know what was really the cause of these stoppages. He might mention a great number; but it was perhaps useless, because there were gentlemen present who knew probably more about them than he did. He thought he saw the object of Mr. Armour's plan. Mr. Hardie did not know the difference between town water and ammoniacal liquor. There was a vast difference; and they experienced it in scrubbing gas. Sometimes water contained lime, which would cause a stoppage; but in ammoniacal liquor there was no lime. He had recently found out a simple process for dealing with stoppages at the first socket. In one setting he had, strange to say, only a single pipe which annoyed him. He found that one of his men, instead of drawing the charges fully, drew only half, and put fresh coal at the front. This started that pipe; and he had never been able to get it properly cleared. He found that stopped pipes could be burnt out by putting up them a heated 2-inch pipe and an iron rod.

Mr. D. Terrace (Middlesbrough) said he had listened with very great pleasure to Mr. Armour's paper, although, he might say, he disagreed with him on almost every point. This very complicated arrangement to every bend of the ascension-pipe seemed to him to be unnecessary. What appeared to him to be essential was to prevent stoppages rather than to cure them. The cause of all the trouble was the hydraulic main. Remove it, and everything would be right. This was his experience. Mr. Armour's arrangement he looked upon as "pottering" with the thing altogether. About twelve years ago, he (Mr. Terrace) introduced water into the hydraulic main. He was in a gas-works recently where there were hundreds of ascension-pipes; and there was a little arrangement at the top of every one for running water down them. He learned from the manager that since he adopted this means of keeping the seal clear, there was no necessity for putting a single drop of water into the ascension-pipe. Therefore he considered that the arrangement which had been put before them was going the backward way to remedy the evil, because, if they kept the liquor in the hydraulic main, then there would be no necessity for using it. It seemed that the cooling effect of running cold water in had more to do with the prevention than anything else. But then, if they used cold water, they would weaken the ammoniacal liquor; whereas if they put in ammoniacal liquor, it would find its way to the tar-well. He was going to ask if any augering was required from the mouthpieces every time. He would be very pleased to show any gentleman the method he had had in use for the past twelve years.

Mr. W. J. Warner (South Shields) said that Mr. Armour had mentioned the fact that he had been in possession of one or two mouthpieces at the South Shields Gas-Works for a day or two. These had been entirely in Mr. Armour's hands; and therefore he (Mr. Warner) was not in a position to say what the result had been. The stoppage of ascension-pipes came, he believed, from irregularity of working, and from nothing else. This was a position which he took up a good many years ago, when the subject was very frequently brought before them at their parent institution. Among the various schemes which had been introduced for the purpose of preventing stoppages, there was one especially which they thought a few years ago was going to take the golden medal. It came from Ipswich, and was a grand scheme of elaborate perforated plates, put in the mouthpieces, which screened the gas as it passed away. He then held, and he held still, that the stoppage of ascension-pipes was due to irregularity of working—the result of the retort getting excessively hot, by changes of coal or other cause. He found the stoppages took place most frequently in retorts where the charge was exhausted soonest. He therefore thought that, if they let the gas go off at a good working temperature, there would be no stoppage of ascension-pipes.

Mr. T. Bower (West Hartlepool) did not think he could add a great deal to what had already been said regarding stopped ascension-pipes. He believed the members were all agreed that they were about one of the worst evils connected with gas-works. He was pleased to be able to state that latterly he had not had much trouble with them. Some eight years ago, they had, at the works with which he was now connected, an old bed of retorts which had been in use for nearly twenty years; and in some parts of them, they were very much troubled indeed with stoppages, chiefly in the bridge-pipes. When he examined these he found that they were not equal in area to the ascension-pipes; and consequently they had the stoppage where the contraction existed. He put in new bridge-pipes, of larger area; and since then not one had been stopped. In this bench he erected one setting of patent regenerative furnaces. It was a setting of seven; and one retort was immediately over the fireplace. This retort gave a good deal of trouble; the ascension-pipe stopping, not only at the mouthpiece, but right up to the top. He passed cold water in by means of a $\frac{3}{8}$-inch cast-iron pipe, allowing it to trickle down the pipe. A friend advised him to take out the iron pipe, and to put in a steel one. He did so; and he did not think he had ever had a stopped pipe since. He supposed it was the extra heat in consequence of the retort being over the fireplace which was the cause of the stoppage. Another reason probably was that the retort-house was a little narrow; and being naturally anxious to have the longest possible retort in, the ascension-pipe was placed as close to the bed as he could get it.

Mr. Hepworth remarked that at his works the whole of the hydraulic main had been supplied with water for some years past; but, unfortunately, this had not cured occasional stoppages of the ascension-pipes.

Mr. Terrace asked if the water was run continuously into the hydraulic main, because that was what he referred to.

Mr. Hepworth replied that it was changed every six hours.

Mr. Armour, in reply, said that, at the beginning of his experiments, he used water; but it was exceedingly hard, and had a tendency to coat the pipe. The ammoniacal liquor which he employed was weaker than most ammoniacal liquors which were produced from coal in the ordinary process of gas making; and when he began to use it instead of water, it kept every pipe clear. He discovered, accidentally, that the effect of the ammoniacal liquor upon the pitch already formed in the pipe was much greater than the effect of clean water. The liquor was the crude or first liquor, such as they would take from the hydraulic main in a gas-works. Now, ammoniacal liquors from the hydraulic were not clean waters with a flavour of ammonia. They contained a percentage of the finer condensable hydrocarbons; and he presumed, in using ammoniacal liquor, they restored to the gas as it came from the mouthpiece that which the gas carried to a point where it was of no further use. As to the loss of ammonia, there was exceedingly little exposure to the ammonia; and what did not go off by evaporation passed into the retort, and therefore was condensed over again. Practically, therefore, the loss must be a very small fraction. Mr. Hepworth's more recent experience was as new to him that morning as it was to the whole meeting; and he was exceedingly

obliged to that gentleman for the manner in which he had conducted the experiments for him, and also to Mr. Warner for giving permission to have the arrangement placed in his works. His feeling even as to the most expeditious method of removing obstructions in ascension-pipes was that, if they could find a plan for preventing them, it was preferable to any method of removing them. Some time ago he said to Mr. Hepworth that he marvelled ascension-pipes were not made of steel or wrought iron, because he found, in the work he did in connection with the inlet-pipes under the coke-oven floors, that cast-iron pipes took pitch much more readily, and that when it was on it was knit more closely to the iron than it was to steel. There seemed to be a distinction in nature between pitch and cast iron, which was not the case between pitch and either wrought iron or steel. He was very greatly obliged to the members for the manner in which they had received his paper, and for the criticisms that had been offered. Although his suggestions might be but little adopted, some facts might have been brought out which would be of advantage to the gas industry.

Mr. W. Ford (Stockton) proposed a vote of thanks to Mr. Armour, who, he said, had come among them as a stranger. It was so long since he had had a stopped ascension-pipe that he had forgotten what it was. He really must differ from his old and esteemed friend Mr. Terrace, who said the water in the hydraulic main was a perfect cure for stoppages. He himself tried it many years ago; and now he was working with a seal of tar in the hydraulic main, and he had no stoppages. He believed that Mr. Armour's cure would not be successful in every case. There was variety in coal, variety in temperature, and variety in the construction of apparatus. Everything must be studied on the spot, if a cure for the evil was to be found. If those gentlemen who converted gas coal into coke were to adopt this little invention of Mr. Armour's, it might be the means of accumulating thousands a year to them. He had had some little experience of the Simon-Carvès process, at a colliery; and if Mr. Armour's inventions could be applied to that process, there would be great benefit to colliery proprietors who worked up their secondary products in that way.

Mr. Bower seconded the motion, which was unanimously carried.

Mr. Armour briefly acknowledged the vote.

Votes of Thanks.

Mr. J. H. Cox (Sunderland) proposed a vote of thanks to the President. He was, he said, quite certain that, if gentlemen in similar positions to Mr. Wallis were to do as he had done, it would benefit them all.

Mr. T. Trewhitt (West Hartlepool) seconded the motion, which was passed.

The President having thanked the members for their confidence in him,

A vote of thanks was accorded to the Secretary and Treasurer, on the motion of Mr. Warner, seconded by the President.

The Association were afterwards entertained to dinner in the Royal Hotel, by the Directors of the South Shields Gas Company. Several members of the South Shields and Jarrow Corporations were also the guests of the Directors. Mr. Wallis again presided, and made a most genial Chairman. In acknowledging the toast of "Kindred Associations," Mr. Hepworth expressed regret that it was not responded to by the President of The Gas Institute. Mr. Valon, he knew, fully intended to be present that day, but had written to say he was prevented by a previous engagement.

GAS LIGHTING AND VENTILATION.

At a recent Conference of the members of the Belgian Association of Gas Managers, M. Bandsept read a paper on the above subject, in which he described the system of ventilation by means of gas lighting which he has carried out in the rooms of the Association in Brussels. The following is an abstract translation of the paper.

The author commenced by remarking that one of the inconveniences frequently stated to attend the use of gas is the great quantity of heat generated by it in the places where it is consumed for illuminating purposes. Electricians, as is well known, never fail to magnify this defect. But the answer that can be promptly given to them when they bring forward this objection is that the evil is not irremediable, seeing that in the majority of cases it would be easy to carry out an installation of gas lighting by which the air would not be vitiated. More than this, gas could be made to play an essentially useful part, by being turned to account in improving the hygienic conditions. In this way one of the chief arguments used in support of electric lighting would be disposed of at a stroke, while gas would give one more forcible proof of its practical qualities. In fact, natural ventilation, which results from the difference in the density of the inside and the outside air, is attributable to atmospheric variations, and consequently can only conduce to uncertain effects. Aëration by means of open fires is not generally so efficacious as people try to make out; and in several respects it presents inconveniences. This leads to a preference for mechanical ventilation; and among the means to be employed for this purpose, the simultaneous application of the lighting and heating power of coal gas presents itself as one of the most rational. Recuperative lamps possess the great advantage of reducing, in a very notable degree, the deleterious action of coal gas, by converting into luminous rays the non-utilized heat of combustion. These lamps are consequently better fitted than any other appliances to perform the important part devolving upon gas in ventilation. The problem, thus regarded, is capable of solution in two ways, according to whether the object is to carry out a certain determined system of lighting, or the elimination of the vitiated air from a closed space wherein it is desired to maintain a given temperature.

The author went on to remark that the complete study of a system of ventilation actuated by the combustion of gas is a rather complex subject. It comprises the extent and distribution of the lighting; the volumes of gas and air necessary to produce the desired effect; the quantity of vitiated air to be conveyed away, and of fresh air to be introduced; the distribution of the temperatures in the locality under consideration; the force and direction of the currents engendered by the entrance and exit of the air; and, lastly, the radiation from the gas burners and lamps. The practice of ventilating by gas has not yet become very general. However, thanks to a rational application of the heat evolved, it is possible to ameliorate, in a large measure, the hygienic conditions under which we live. By means of high-power lamps fitted up for ventilation, it is an easy matter to carry off the products of combustion; and the lighting conduces to a renewal of the air, and consequently to the rendering of the apartment salubrious. The lamps act first of all by means of the volume of air necessary for feeding them, and afterwards by that which is drawn along in the movement of the products of combustion. The effect of these two actions is proportionate to the consumption of gas; or, to be more exact, to the degree of temperature developed in the lamps. Vitiated air generally rises towards the ceiling; and it is from there that it must be removed, especially if the outside temperature is higher than that of the place to be ventilated. In this case also, care has to be taken to close the outlet orifices, which are made in the lower part of the apartment; for it is obvious that every well-managed installation should help to carry off the vitiated air as well below as above. The fresh air, which, by preference, should be made to enter by special openings independent of the doors, ought not to flow at too high a speed, or at a temperature appreciably below that of the locality to be supplied; and, of course, the intakes should be protected from every deleterious emanation. They should necessarily be situated at a sufficient distance from the outlets. When the outer air is laden with smoke, it is well to take the precaution of filtering the inflowing current. The temperature which it is important to maintain in the interior of inhabited apartments varies according to the length of time they are occupied, and to the degree of activity of the ventilation. On an average, it should be from 16° to 20° C. (60° to 68° Fahr.).

In order to adapt high-power gas-lamps to ventilation, the chimney has to be surrounded by a casing or sheath, whereby the vitiated air is drawn up and carried along by a current of air determined by the products of combustion. The bell by which the drawing operation is effected is surmounted by an exit-pipe opening into the outer air or into a chimney. Two or more lamps may be connected in such a way as to turn their products into one common flue situated near the ceiling, and leading into a neighbouring chimney or to the open air. The simplicity of the means to be employed in fixing ventilating lamps renders the work easy to anybody. Nevertheless many precautions have to be taken which practice alone can teach; and the neglect to observe them would, in certain cases, have for result to compromise the safety of the installation, and interfere with its proper action. Generally, the appearance of installations of this kind leaves little to be desired. In most cases the piping is completely concealed by false rafters, either in wood or in sheet iron, producing the effect of a chambered ceiling. In new buildings, it will always be easy to turn to account, for the ornamentation of the rooms, the various conduits necessary for ventilation. Under these conditions, the more this elevated canalization is made to ramify in all directions, the more will the lighting and ventilating appliances become independent one of the other, and their useful effect increased. As each of the lamps would be acting under its normal conditions, the slightly appreciable variations occurring in the working would be diminished by the gaseous mass in circulation in the collecting-flue.

Various reasons make it impracticable for each lamp to be connected with a separate channel; but at all events it is desirable that a channel should serve for only a small number of lights. In any case, the exhaust-pipes should be of suitable size, in order to ensure good ventilation. Their sectional area depends upon the speed set up at the average temperature of the mixture of smoke and air in the flues, as well as upon the natural draught of the chimney. It evidently augments with the volume of air which the lighting appliances should draw in. As the temperature of combustion is so much the greater in proportion to the height of the temperature at which the combustible is introduced, it follows that the lamps which are most recuperative are those which will also ventilate the most energetically. In high-power lamps, the lost heat of the flame

serves to raise to a high temperature the air which supports the combustion of the gas. With the types of the lamps employed for industrial purposes—those consuming 300, 450, or 600 litres (10, 14, and 21 cubic feet) of gas per hour—the waste gases are evolved at about 290°, 390°, and 460° C. respectively. The collecting chambers being generally of metal, their sides are liable to become heated to a sufficiently high degree to constitute a permanent danger of fire, if care is not taken to prevent them from coming in contact with the joists. The chambers are isolated either by locating them at a sufficient distance from the ceiling, or by interposing between the latter and the hot metallic walls of the chambers, some substance impervious to heat, or having the property of diffusing it. The former method is only applicable when the apartments to be ventilated are of considerable height. Consequently, in the majority of cases, artificial means of isolation—by the use of pulverized refractory materials, asbestos, &c.—have to be resorted to. The radiation of heat may likewise be intercepted or dispersed by superposing screens in the space between the hot surfaces and the ceiling. The screens are arranged in such a manner as to impart by convection, to the air surrounding them, the heat which they themselves receive. By contriving, perpendicularly to the flue, a chamber open at its two extremities into the wall, a current of air is obtained sufficiently active to lower the temperature of the entire system. These screens will act with the more energy in proportion to the speed of the induced currents, and the force with which they strike the sides of the plates intercepting the rays of heat.

The author then proceeded to describe installations of high-power lamps of the "Gaso-Multiplex" type, in which the principles enunciated above had been applied. They are shown in the accompanying illustrations.

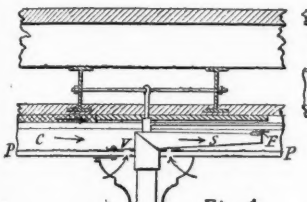


Fig. 1.

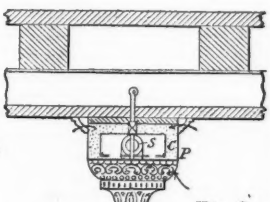


Fig. 2.

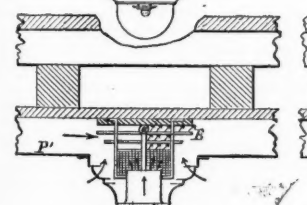


Fig. 3.

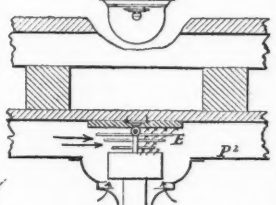


Fig. 4.

Figs. 1 and 2 are side and end views of the installation at the establishment of the Belgian Association of Gas Managers in Brussels. The collecting-pipe C is placed inside a false joist P, to which the lamp is fixed. The air circulating between the pipe and the joist acts as an insulator. By excess of precaution, a layer of asbestos is put above each lamp, in those places which are more directly exposed to the action of heat. Besides, the joists being in this case ironwork and masonry, there was all the greater necessity to reduce the depth of the beams, as the ceiling of the room was not very high. This installation, with its ornamental lamps concealing the air-inlets and the ventilators, presented a most satisfactory appearance. Figs. 3 and 4 show ventilating lamps fitted with metallic plates, the object of which is to intercept the radiated heat, which afterwards inflects under the impulse of the interrupted current set up, immediately below the critical point, in the joists P_1 P_2. It has been shown that, in order to utilize high-power burners for ventilating purposes, it is sufficient to surround the chimney with a sheath or casing, so that the products of combustion may pass to the centre, and thus form a draught for the vitiated air which is drawn into the stream of hot gases. But the way in which the liberation of the smoke-laden fumes in the collecting-flue is operated is not an unimportant matter. It has a very manifest influence, not only upon the regularity of the aëration, but also upon the steadiness of the light. In order to connect a lamp with the service-pipe, the shortest way would be to separate the upper part of its chimney by a metallic casing, conical at the base, and the top abutting upon the canalization, as shown in fig. 3. This arrangement, however, does not give good results; for, when the lamp is near a chimney, it is difficult to protect it from the return currents of air, the effect of which is to make the flame unsteady and cause variations in the rate at which air is drawn in through the periphery. When, with the object of counteracting these effects, an attempt is made to increase the draught, the luminous surface of the flame vibrates under the tension resulting from the conjunction of the induced currents immediately above the inductor jet. One is then led to agitate the gases in the interior of the flue by the use of a conical adjustment, as is done with injectors. This arrangement was decided upon by M. Aerts, after having a number of trials carried out in Brussels; and, as shown in fig. 1, it was also adopted for the installation at the rooms of the Association. The chimney of the lamp is surmounted by an elbow-piece S, which is prolonged more or less into the flue, and decreases in diameter towards its extremity. By closing this conical pipe by means of a flap F, manipulated from the outside of the beam P, the formation of deposits of the products of combustion in the interior of the lamp, when the light has been extinguished, is prevented. In this case also, care must be taken to cover the air-inlet V, as otherwise a passage would be afforded to the mixture of in-drawn air and the products of combustion given off by the second lamp, supposing this to remain alight. From that time the lamp is completely isolated from the flue, and cannot possibly cause any disturbance in the action of the other parts of the installation contributing to the lighting. The air-inlet V is worked by an articulated lever, one of the arms of which extends beyond the cap, within reach of the hand for regulating purposes. The flue C, in which are collected the smoke-gases and the aspirated air, usually leads into a chimney.

In the installation put up for the Association, a definite quantity of light had to be furnished; that is to say, each room admitted of an amount of lighting which it would have been abnormal to appreciably exceed. In the room used for the exhibition of gas heating appliances—30 ft. by 14 ft. and 13 ft. high—two No. 3 lamps of the "Gaso-Multiplex" type were placed, each giving the light of 13·5 carcels (128 candles) with a consumption of 450 litres (15·9 cubic feet) of gas per hour. These lamps, suspended at a distance of 2 ft. 9 in. from the ceiling, were so fixed as to allow a space of 9 feet between them and the wall. Under these conditions, admitting that the lighting plane was at a distance of 3 ft. 3 in. from the floor, the lights would be situated 7 feet from the plane. In the four corners of the apartment, the luminous intensity would be at the minimum; while its maximum would necessarily be immediately beneath the lamps. By this system of lighting, nearly 5000 cubic feet of fresh air per hour were drawn from without, and made immediately available for respiration. This bulk of air, added to that entering by the door, was ample for sufficiently changing the atmosphere. It has been found that with the temperature outside varying from 3° to 4° C., the heat within has only increased 2° C.—from 18° to 20° C. (64° to 68° F.)—after four hours' lighting.

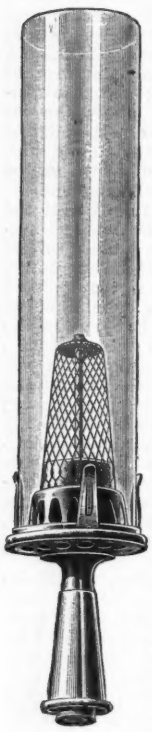
As to the useful effect of ventilation by means of high-power lamps, it follows, from a comparison of the heat-units in action during the movement of the available fresh air with those resulting directly from the combustion of the gas, that one cubic metre (35·3 cubic feet) of gas completely burned gives off 5400 calories. The calorific capacity of the air, brought to its volume, is 0·312. It therefore follows that the 900 litres (31·8 cubic feet) of gas consumed per hour for the lighting produces 4760 calories. On the other hand, the 137 cubic metres of air introduced absorbs ($137 \times 0{\cdot}312 \times 52$) 2220 calories. The yield is consequently about 45 per cent.—a very good result indeed. These figures show what great effects are obtained from illuminating gas by applying high-power lamps to ventilation. Already the increase in luminosity with these appliances is equal to an economy of nearly 50 per cent. in the consumption required by lamps with ordinary burners; and now to this advantage is added a rational utilization of a quantity of heat which up to the present time has been lost. This bears upon a question of hygiene of absolutely primary importance, which has for a long time been awaiting solution. In this way gas reveals once more the fact that not only does it lend itself to the solution of essentially practical problems, but does so under the most advantageous commercial conditions.

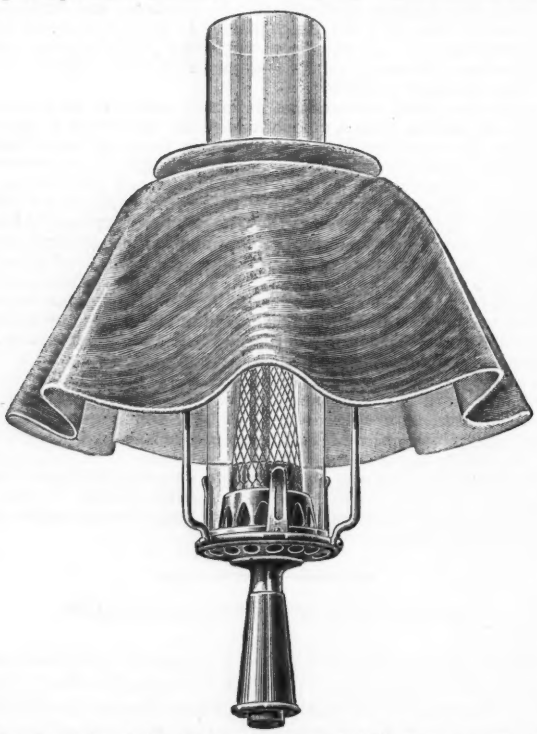
THE LUNGREN INCANDESCENT GAS-LAMP.

The apparatus illustrated on the next page has been designed by Mr. C. M. Lungren, of New York, for use with illuminating gas. It consists of a special form of Bunsen burner upon which is mounted the light-giving body that is raised to incandescence by the heat of the flame.

The incandescent portion of the burner consists of a conical net-work of threads of refractory metallic oxides. They are interlaced after the manner of wire gauze, so that the structure, as a whole, is sufficiently elastic to withstand the extremes of temperature to which it is exposed in use, without danger of breaking. It is, moreover, sufficiently strong to allow of the necessary handling; the threads themselves being hard and

brittle. This quality is the result of the method of manufacture, which consists in pressing out the threads from a putty-like mass composed of the oxides used and glue. After being woven to the proper form, the structure is burned in a flame at a considerably higher temperature than that of use; and in this operation the glue is melted out, and the refractory oxides compacted into a dense nearly glazed condition. The oxides used are those of the rare metals; as it has been found, after prolonged experiment, that these alone last sufficiently long to be available. Particular care has been taken to keep the colour and quality of the light near to the accepted standard; and much experimentation has been necessary to accomplish this. The light produced is a full yellow, with good diffusive power; and even if made much whiter, as it will be in the larger lamps, will always have an undertone of yellow. The materials used appear to be nearly fixed at the temperature of use, and would last an indefinite period if the incandescent substance did not break up after a time by mechanical shock. There appears to be but little, if any, deterioration of the light upon prolonged burning. The "incandescents" have been burned 5000 hours, and have still, it is stated, been in fair condition. They may, we believe, be safely guaranteed for 500 hours; and the probability is that, in actual use, they may have a useful life of even 1000 hours. It will be seen from the illustration that the "incandescent" is mounted upon the burner on a centre post; so that there is nothing exterior to it to interfere with the light. After once being set in position, there is no need to handle it until it is to be renewed; and it is protected against being struck when removing the chimney, by the combined shade and chimney-holder, which effectually guides the chimney without the necessity for any care being taken. While the "incandescent" is brittle, it will stand both the shock due to lighting and such mechanical jar as that to which a gas-fitting will ordinarily be subjected. The form of Bunsen burner which has been adopted is that which experience has shown to give the best results. It consists of a group of small tubes set in a shell; the tubes projecting slightly above the top of the shell. This form of burner, when the chimney is in place, produces a number of small jets giving an intense flame.





The air-mixing tube of the burner is slightly taper, and rests upon three taper ribs on the gas nozzle; so that the whole fixture can be taken down without disturbing the gas connection. The gas nozzle automatically controls the flow of gas into the mixing-tube; the outlet of this tube being varied by the insertion and withdrawal of a taper-headed pin attached to the float-valve of the governor. This form of nozzle secures a constant flame with varying gas pressure, and allows the lamp to burn under the condition of the maximum pressure available at any time. The "incandescent," being hard and strong, will stand a flame under any desired pressure or draught. Lamps of any required size can therefore be made, and adapted for either inside or outside use. This method of producing light by means of gas consequently constitutes a distinct system of illumination applicable to nearly all situations in which an artificial light is required.

An American correspondent has forwarded the above particulars; but it may be added that samples of lamps constructed upon this system have been sent to us, and an early opportunity will be taken of testing their capabilities.

GAS-ENGINE SUB-STATIONS.

In a recent issue, our contemporary the *Electrician* discussed the above subject in its editorial columns, with special reference to the decision of the Cork Gas Company to apply for powers to supply electricity in the city. The article was as follows:—

The proposal which has been made by the Gas Company of Cork to generate and supply electrical energy by means of scattered stations worked by gas-engines, offers a very interesting problem to the engineer, and is a matter of considerable importance to many others than the inhabitants of the town in question. Taking the price of electric supply on the one hand at 7d., or even the 6d. which is talked about, but not frequently found in practice, and reckoning the cost of generating a unit by gas-engines at less than 2d., there is something very tempting in the idea. It is obvious that this scheme not only makes use of the existing gas-mains instead of expensive conductors, but does away with the necessity for a special staff of clerks and collectors, to say nothing of directors. We have alluded more than once to the subject in these columns, and have commented on the policy and the cost of such a scheme; our attention having recently been called to it by the leading gas journal. On the latter occasion it was proposed to use this system in Glasgow; and there it would have had a more satisfactory field than in Cork. But it would be interesting to see the system tried on a fair scale; and our gas friends must excuse us if we venture to prefer that the cost of such an undertaking should fall upon them, for the electrical industry has sunk too much money in pioneer work which has turned out to be more useful as a lesson than profitable as an investment.

There are a good many different points requiring careful consideration; for while the principle of feeding a low-pressure network by separate dynamos avoids the use of mains and feeders, the generating stations cannot be multiplied without serious increase of capital expenditure and cost of labour. We may take for an example a station capable of running 500 16-candle lamps—say, 32 kilowatts. The slow speed of gas-engines makes direct driving out of the question; and belting would have to be used. So that a commercial efficiency of more than 86 per cent. could not be expected; thus demanding 50-horse power, or 1250 cubic feet of gas per hour. Taking gas at 3s. per 1000 cubic feet, we consume 45d. worth per hour; getting a unit of electrical energy for 1·4d. It is this figure, so easy to calculate, which is at first so encouraging. But, after all, this only represents the consumption of fuel; and this we know, from Mr. Crompton's last paper, may be put, under favourable circumstances, at a slightly lower figure. When we say "favourable circumstances," we refer to existing stations, and not to ideal ones. If it were not for the unfortunate waste in the boilers, we might approach the 2½ lbs. of coal per unit, which ought to be sufficient, and which is amply sufficient when the plant is subjected to a regular test. This would bring down the fuel to 0·275d. per unit; and gas would have to make up the difference between this and 1·4d. in other directions, if it ever has this price to compete with. It is, however, to be remembered that in the case of gas supplied by a gas company to its electrical department, the actual cost of production of the gas would probably be charged, so that the cost per electrical unit generated would be less than the 1·4d. worked out above, though how much so would depend upon the manner in which the accounts of the electrical concern were entered in the company's books. The cost of plant, and therefore the upkeep, must necessarily be dearer under this system of distribution by gas-engines. A reserve must be kept at almost every station; and not only do two 50-horse power dynamos cost more than one of 100-horse power, but gas-engines are very expensive machines for their output when all the tanks and fittings are included, and the cost of the several buildings must be added. The boilers of a steam station must not be taken together with the engines in making a comparison with gas-engines, since the gas company practically throw in the cost of generation in the price of the gas. If it is proposed to use even a small battery reserve, the cost of labour in attending to a number of scattered accumulators would be very appreciable; and it is not easy to see how light loads could be met satisfactorily, unless by using two gas-engines to each dynamo. If, however, there is one member of the gas industry who is better able than another to plan and to develop such an undertaking, Mr. Denny Lane, the Secretary of the Cork Gas Company, is the man.

The Gas Workers' Union.—As a result of Mr. Pete Curran's organizing tour in the Manchester district, branches of the Gas Workers' Union have been formed at Blackburn and Stockport.

REGISTER OF PATENTS.

Gas Station Governors.—Hawkyard, J., and Braddock, J., of Oldham. No. 16,056; Oct. 10, 1890. [8d.]

This invention relates to the class of gas-regulators known as "gas station governors," employed for controlling the pressure in the mains whatever may be the pressure in the gasholder or other source of supply, and to compensate for any increase or decrease of consumption.

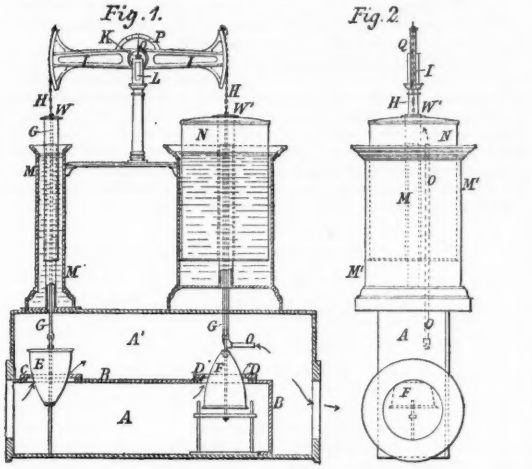


Fig. 1 is a vertical section of the regulator; and fig. 2 an end elevation.

The regulator consists of a gas chamber divided by a partition or mid-feather B, forming an inlet chamber A and an outlet chamber A^1 communicating with the main. In the mid-feather are two openings C and D—one near to each end—the edges of which are faced so as to form seatings (or they may be fitted with seatings, as shown); and they are provided with two parabolic or other form of valves E and F, the former closing downwards and the latter closing upwards, through which the gas passes (as shown by the arrows) from the inlet to the outlet. The valves are connected by valve-rods G and chains H (or cords) to the two opposite ends of a balance-beam I, the centres of which are supported on pivots or knife-edges K carried on a central pillar L. The rod G of the valve E (which closes downwards) passes out of the chamber A through an ordinary water-seal M in the top of the outlet chamber; and the rod H of the valve F (which closes upwards) also passes out through a water-seal M at the top of the outlet chamber. But the water-tank M^1 of this seal is made of larger diameter; and to the top of the valve-rod G is attached a bell or receiver N also of large diameter. A pressure-controlling tube O, open at both ends, is also fitted in the top of the outlet chamber A^1, so as to admit gas from the chamber into the bell N above the water-level.

By this arrangement of two valves balancing each other, and acting in opposite directions in combination with a bell or receiver, the patentees claim that they are enabled to use exceedingly light valves, and to dispense with the use of the heavy valves and counterbalance weights heretofore employed; and thus to greatly diminish the weight and expense of the governor required for a main of a given diameter.

The tops of the water-seals at W W^1, must be weighted to correspond with the desired pressure, and so that both valves will be kept open (as in fig. 1) as long as this normal pressure is maintained.

If, from diminution in the consumption of gas, or from other causes, the pressure in the outlet chamber A^1 increases, the bell or receiver N will be raised, and thus close both the valves E and F more or less as may be required, so as to diminish or shut off the supply. On the other hand, if the pressure in the outlet chamber A^1 should decrease, the bell N descends and opens both valves E and F wider, so as to increase the supply; and as the outlet chamber A^1 is in direct communication with the main, the pressure of the gas in the latter will always be kept regular.

The balance-beam may be provided with a graduated quadrant P and a fixed pointer Q to indicate the variations of pressure; and the valves E and F may advantageously be provided with spindles to keep them central and prevent oscillation. One or both of the chains H may further be fitted with adjusting screws to set the valves, so that they shall open and close together with absolute accuracy.

By carrying the back-pressure tube O through the mid-feather B, A may be the outlet chamber, and A^1 the inlet chamber.

Water-Meters.—Lucchesini, A., of Florence, Italy. No. 16,469; Oct. 16, 1890. [8d.]

This invention has reference to an arrangement of water-meter constructed with a regulator, which, without interfering with the indication of the volume discharged, enables the discharge to be adjusted to suit the initial pressure.

The meter comprises a metal box made in several parts, connected together by screw joints or studs, and closed by a thick glass plate capable of withstanding high pressures. The entering water is deflected by the part of the wall of the box opposite the inlet through inclined orifices formed in a fixed cone. These orifices may be uniformly distributed in the cone, or be reduced to a few arranged in or near a plane passing through its axis. After the water has passed through them, it acts upon a screw having one or two threads (made very light, of metal or even of ebonite), which is supported by two pivots, so as to be moveable about its axis. The motion imparted to this screw under the action of the moving water, is transmitted, by worms and toothed wheels, to clock mechanism, consisting of four toothed wheels corresponding to four dials visible through the glass plate. The speeds of these four wheels are in a ratio to each other of 1 to 10; as this allows of registering up to 1000 cubic units of flow of water. Above the cone is a regulator of hollow conical shape, which fits exactly over the cone, and can be moved about its axis. It is perforated with a similar number of holes to the cone, which according to the position given to the cone, will leave its passages full open, or will close them to a greater or less extent. The adjustment can be effected when the parts of the apparatus are being fitted together, or when it is being erected in position for use; and it is evident that such a meter will work efficiently whether in a vertical or other position.

Water-Meters.—Hill, L., of Hillhead, Glasgow. No. 16,983; Oct. 24, 1890. [8d.]

This invention of a meter for measuring water or other liquids, consists in the combining of moving parts, which must be actuated by the person requiring the liquid, with the measuring vessel, so that the liquid to be measured is first admitted into the measure by opening the supply valve or duct. Then the supply valve or duct is closed; and thereafter the discharge valve or duct is opened, and the measure full is run off. The discharge orifice is then closed, and the supply orifice opened, so that the measure may again fill. According to one plan of carrying out this invention, either a two-way or a three-way tap is employed; or small slide-valves may be arranged for admitting the liquid into the measure, and drawing the measure full off. The plug or axle moving the valve or other parts which open and shut is only allowed to turn in one direction; and a counter is attached for registering the number of turns of the plug or axle, so as to constitute a measure of the quantity of water used.

Gas-Engines.—Mottershead, D., of Ardwick, Manchester. No. 17,299; Oct. 29, 1890. [8d.]

The object of this invention is to simplify the working parts of a gas-engine, and lessen their number by combining together into one valve all that are required to control the admission of gas and air, the ignition, and the exhaust.

At the back or at the side of the cylinder, there is a valve chest or chamber of cylindrical form, with two ports leading into the cylinder. Into this valve chest is fitted a cylindrical valve of plug form, and hollow for a portion of its length. Into the plug are cut preferably four ways or ports—two leading into the admission port of the cylinder, and two into the exhaust port. The two into the admission port are preferably cut into the side of the plug, and communicate with two other ports in the valve-chest, one of which admits gas and air, and the other connects with the ignition-tube. The two ways or ports which communicate with the exhaust port of the cylinder are preferably cut through to the hollow part of the plug, which communicates through its end with an exhaust-pipe. The cylindrical valve-chest is preferably made so that any wear occurring in it, or in the plug-valve, can be taken up or compensated for by means of set-screws or the like. It is also preferably provided with a water-jacket to keep it cool, which may be connected with the water-jacket of the cylinder or with the circulating tank. The valve is rotated by means of a cog-wheel, disc, pulley belt, or the like, from the side shaft, or other moving part of the engine.

Feeding Fuel to Gas Producers.—Copeland, C. J., of Barrow-in-Furness. No. 17,702; Nov. 4, 1890. [6d.]

This invention relates to apparatus for feeding fuel to gas producers without permitting the escape of gas. For this purpose, on the roof of the producer is mounted, on a vertical axis, a cylinder which is caused to revolve slowly between a base plate below it and a cover plate above it. The cylinder has cavities or pockets arranged around its circumference, which, as the cylinder revolves, come successively under an orifice in the cover plate and over an orifice through the base plate on the opposite side of the circular path in which they move. Above the orifice in the cover plate is a hopper or bunker containing fuel, a portion of which falls into each pocket as it presents itself under it. This fuel is carried round in the pocket until it comes over the orifice of the base plate, through which the fuel drops into the producer below. The opening of the hopper or bunker is fitted with a slide, to cut off the supply when required; and the slow revolution of the cylinder is effected by worm gearing, worked step by step by a rachet and pawl from a crank or eccentric, or by other means.

Producing Oxygen Gas.—Fanta, F., of Gresham Street, London. No. 3034; Feb. 19, 1891.* [6d.]

The object of this invention, according to the words of the patentee, is to produce a continuous supply of oxygen in large quantities, to render the production practical and reliable, and more especially to make it independent of delicate chemical reactions.

The only process employed at present for producing oxygen on a large scale, it is pointed out in the specification, consists in heating baryta or oxide of barium, over which a current of air is passed; thus oxidating the material. When the baryta has been oxidated, the heat is still more increased; and the tubes or retorts containing the material are submitted to a vacuum, whereby the oxygen is set free. The inconveniences of this mode of operating are that it is not only difficult to regulate the temperatures, but also at such high temperatures the material cakes and adheres to the retorts containing it; thus intercepting the passage of air, and considerably reducing its oxidizing power. The process now proposed is based on the principle that manganates of soda, when heated and intimately mixed with a current of steam, give up a certain amount of their oxygen (thus becoming reduced to sesquioxides of manganese); and that such residue may be regenerated by heating the material in the presence of a current of air, so as to again form manganates. This principle, which forms the basis of the Tessié du Motay process, has, however, not met with any success, in consequence of the material here also melting and caking in the retorts. This melting and caking of the material is further brought on by the

* The date claimed for this patent, under section 103 of the Patent Act, is Oct. 22, 1890—being the date of the first foreign application (that for Belgium).

moisture introduced into the retorts—not only by the steam, but also by the dampness of the atmospheric air, which latter, in entering the tubes, becomes condensed therein, owing to the differences of temperature. That is to say, when the material is overheated, the rapid creation of steam caused by the moisture of the air acts as a reducing agent; while, when the material is colder than it should be, the moisture of the air passed over it gradually renders it soft—resulting in the baking or caking of it. The same inconvenience also occurs when steam is introduced into the retorts.

To avoid these difficulties, and in order to make the process continuous, the material (manganate of soda) employed according to the present invention is, previous to its insertion into the tubes, treated in a special manner for the purpose of rendering it granular and non-fusible. To attain this object, it is prepared in the same way and under the same circumstances as those under which it will eventually have to be acted upon during the production of oxygen as hereafter described. In order, moreover, to avoid any changes of temperature, both during the time when air or when steam is being passed over the material, and with the object of escaping the inconveniences of condensing the moisture suspended both in the air and in the steam, and brought about mainly by the difference of temperature between the material in the air or the steam, the present invention provides apparatus by means of which the material, as well as the air and the steam, are submitted to the same heat and kept at the same temperature previously to either the steam or the air, as the case may be, coming into contact with the material.

The manganate of soda or potash used for inserting into the retorts or producing tubes is prepared as follows: The manganate is carefully mixed with a small quantity of water in which about 5 per cent. in weight of caustic soda has been dissolved, until a thick paste is obtained; and this mixing is best done mechanically, so as to ensure perfect homogeneity. The paste is next submitted to slow heat, for evaporation under occasional stirring. When evaporated, the material (which, having been heated in a shallow evaporating pan, takes the form of a tablet) when cold is reduced to small fragments; and it is in this reduced granular state submitted to considerable heat. Being absolutely porous, it will readily allow the oxidizing air and the de-oxidizing steam to penetrate into its pores, and will neither fuse nor cake even at a very high temperature, and not unless the temperature by far exceeds that under which it has thus been prepared.

In order to further maintain the temperature constant throughout the process, and also to obtain a continuous supply of oxygen, the apparatus is mainly composed of a furnace in which are inserted a heating appliance for the air, a superheater of steam, and two independent series of tubes or retorts containing the prepared material. In this way one of the series is traversed by superheated steam, the effect of which is to de-oxidize the manganate of soda in reducing it to sesquioxide of manganese—giving up oxygen, which is collected in a holder after having passed through a cooling and washing appliance; while the second series is simultaneously traversed by heating air for the purpose of regenerating or re-oxidizing the sesquioxide of manganese contained therein as the result of the previous operation. Thus, if a continuous stream of superheated steam and of heated air be kept up, and if steam is applied to one of the series while air is applied to the other, and *vice versâ* continuously, an uninterrupted supply of oxygen will be obtained without any possible change of temperature, in consequence of the steam, the air, and the material-heating appliances being all contained in one furnace, and under the influence of the same heat.

Manufacture of Hydrogen Gas, or a Mixture of Hydrogen and Carbon Monoxide.—Lewes, V. B., of Greenwich. No. 20,752; Dec. 19, 1890. [8d.]

In his specification, the patentee remarks that one method of producing hydrogen gas as heretofore practised has been to pass steam over red-hot iron. The steam becomes decomposed, the oxygen combines with the iron, and the hydrogen passes off. In the course of time, the whole of the iron becomes oxidized, and then the process stops. Also the rapid fall in temperature during the action, shortens the period during which hydrogen can be made from a given charge of iron. According to this invention, the same iron is made to serve again and again; being reduced after each operation to the metallic state by the passage over it of carbon monoxide. The iron is then ready to serve for the absorption of more oxygen from steam, until it becomes again charged with oxygen, when the reducing process is repeated. The heat evolved in the production of the carbon monoxide can be utilized to keep the iron at the requisite temperature for a long time; while additional heat for this purpose can be evolved by the further oxidation of the carbon monoxide to carbon dioxide. Any carbon monoxide that escapes can be employed in raising steam or otherwise.

Apparatus suitable for carrying out the process comprises a gas producer, in which coke or other fuel is imperfectly burned under an air-blast admitted by one or more nozzles or tuyeres. Within this producer (preferably arranged vertically in the centre) is a retort filled, or partly filled, with fragments of iron—such as borings or turnings if hydrogen alone be required, or with a mixture of iron and carbonaceous material if a mixture of hydrogen and carbon monoxide be wanted for fuel purposes. A steam-pipe or superheater is so arranged within the gas producer as to present sufficient surface to ensure that the steam shall become superheated in flowing through it. The superheater may be protected from the action of the gases by asbestos, fire-clay, or other appropriate material. Suitable valves are provided for regulating the flow of the various gases and steam.

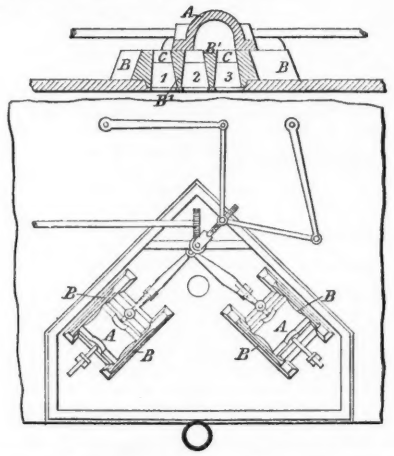
Hydrogen gas is manufactured in such an apparatus as follows: The producer is first of all filled with coke and lighted at the bottom. The blast is then turned on, and the resulting gases—mainly carbon monoxide and nitrogen—are led from the top of the generator through the retort. The contents of the retort become heated to a glowing condition, partly by the heat of the gases, and partly by heat transmitted through the wall from the glowing coke. Should the iron already be in the metallic condition, contact with the carbon monoxide does not affect it; but should it have been left in the condition of oxide from a previous operation, the carbon monoxide will reduce it to the metallic state. When the metallic iron has been raised to a cherry-red heat, the production of carbon monoxide is stopped by turning off the blast; and steam is sent through the heated steam-pipe, and upwards through the retort. It becomes dissociated; and the oxygen entering into combination with the iron, the hydrogen passes out at the exit, and can be collected in any convenient way. The cycle of operations is then commenced afresh.

The apparatus can, of course, be variously modified; for instance, it may have combining with it a carburetting apparatus for converting the hydrogen into illuminating gas.

Gas-Meter Valves.—Foxall, J., of Newport, Mon. No. 11,570; July 7, 1891. [6d.]

This invention relates to the valves of dry gas-meters, with the object of rendering them silent when working.

The valves used are ordinary D valves; and the seat consists of a plate or casting having three openings or ports placed side by side, and separated by a narrow strip of metal or thin partition—called bars. It has been found that, when the valves have become rough or dry through wear, they whistle or make a disagreeable noise, caused by the vibration of the bars forming the valve-seat; and the present invention designs to strengthen or stiffen these bars (so that they will not vibrate and make a noise), by introducing between them, and across the openings or ports, light stays or supports.



The illustration shows a plain view of the valve-plate of a dry meter and a longitudinal section, with the valve in position.

A is the D valve and B the valve-seat, which in this case consists of a cast metal frame B, with cross-bars B^1, which form partitions between the ports 1, 2, 3. These bars are prevented from vibrating under certain conditions by the strengthening or stiffening stays or supports C, which stretch across the ports. As these strengthening pieces are comparatively light, they do not contract the size of the ports to any appreciable extent, but still are sufficient to prevent the vibration of the bars, and produce a silent valve. The stiffening pieces do not extend to the surface of the valve-seat; so that the valve will not touch them or work upon them. Thus the pieces will not cause extra friction to the valve, neither will the valve-seat become dirty or clogged by reason of these pieces, while a clear way for the gas will always be presented.

APPLICATIONS FOR LETTERS PATENT.

15,969.—Austin, C. D., "Improvements in ordinary gas chandeliers." Sept. 21.

16,021.—Ruscoe, J., "Improvements in apparatus for charging inclined gas-retorts." Sept. 21.

16,042.—Clark, S., Hatcher, F., and Challis, E., "Improvements in gas-burners for heating and cooking." Sept. 21.

16,126.—Hill, J. S., "A screw expansion union joint for connecting gas and water pipes and other purposes." Sept. 23.

16,140.—Williams, F. P., "An adjustable apparatus or appliance for the transforming of any open kitchen fire-grate into a gas-grate for cooking purposes generally." Sept. 24.

16,147.—Lanchester, F. W., "Improvements in gas-engines." Sept. 24.

Harrow District Gas Company.—The half-yearly meeting of this Company took place at the Public Hall, Harrow, on Monday, the 28th ult.—Mr. J. Glaisher, F.R.S., in the chair. In moving the adoption of the report, which was noticed in the Journal for the 22nd ult. (p. 545), the Chairman remarked that the Company's business had increased, and there was an additional profit of £51. They stood in a different position from some gas companies with which he was connected. The Crystal Palace District Company, for instance, showed a greatly increased business, but a very decreased profit. He referred to the success of the cookery lectures and the exhibition of gas-stoves in the town; and earnestly recommended the adoption of stoves. Despite difficulties, the balance-sheet was very satisfactory. Mr. John Chapman seconded the motion; and, in doing so, spoke of the disposition to develop the town, and the prospect of increased business. The report was adopted without any adverse comment; and a dividend was declared at the rate of 7½ per cent. per annum. The Chairman proposed a vote of thanks to the Engineer and Secretary (Mr. J. L. Chapman, Assoc. M. Inst. C.E.); speaking in the highest terms of his services. The proposition was seconded by Mr. C. Horsley, J.P., and carried unanimously. Votes of thanks were also passed to Messrs. J. Randall and F. G. Fenton, the Auditors, and to the Chairman and Directors, for the satisfactory manner in which they had carried on the business of the Company.

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The following is the report of the Directors of this Company, which, with the accounts for the half year ending June 30 last, will be presented at the ordinary general meeting of the proprietors to be held on Friday next:—

The Directors submit the accounts for the half year ended June 30, 1891. The revenue account shows a net profit for the half year of £27,919 1s. 8d., making, with £623 1s. received for interest, £28,542 2s. 8d. This, added to the amount brought forward from previous half years, makes £84,559 12s. 1d. Deducting therefrom £2925 for interest on debenture stock, there remains standing to the credit of the net revenue account a balance of £81,634 12s. 1d., of which, having regard to the sliding scale and the price of gas charged during the half year, £46,500 is available for dividend, less the sum of £4, the amount of forfeitures imposed upon the Company in respect of alleged deficiencies in the illuminating power of the gas in January last. The Directors recommend the payment of dividends at the rates of £13 15s. per cent. per annum upon the old stock of the Company, and of £10 15s. per cent. per annum upon the new stock, both less income-tax. The balance of the net revenue—£36,830 12s. 1d.—will be carried forward to the next half year. Mr. Thomas Morrison Fairclough being unable to continue a Director of the Company, owing to ill-health, the Directors have elected Mr. John Giles Pilcher to a seat at the Board in his place. In pursuance of the resolutions passed at the last ordinary general meeting, £31,396 new stock has been issued and allotted.

The accounts accompanying the report consist of the usual statements. The statement of capital stock (No. 1) shows that £702,873 has been paid up, out of a total of £830,000 authorized. The statement of loan capital (No. 2) stands as before—£130,000 raised, out of £300,000 authorized. The capital account (No. 3) shows a total expenditure of £837,153, of which £4987 was spent during the past six months, mainly on new works and stoves. The receipts on capital account amount to £832,873, of which £22,873 was paid up during the six months ending June 30 last; so that there is still a debit balance of £4280. The revenue account (No. 4) shows that the receipts were £177,830, to meet an expenditure of £149,911. There was consequently a balance of £27,919. This account, with the remaining statements, we shall give in full next week.

BRITISH GASLIGHT COMPANY, LIMITED.

At the Half-Yearly Meeting of this Company last Wednesday, it was reported that the working during the past six months had been satisfactory. The profit and loss account showed a balance of £47,129. On the credit side of the account, the following items appeared (excluding shillings and pence): Balance brought from the last account, £46,618; rents, £100; interest, £1432; Clonmel rent, £85; Hull profits, £11,306; Norwich do., £2899; Potteries do., £3782; Trowbridge do., £1269; Holywell do., £245; Yarmouth tar-distilling profit, £409; Norwich reserve fund for deficiency of profit at this station, £3640; Potteries reserve fund for deficiency of profit at this station, £530—making a total of £72,320. The items on the debit side of the account were: April dividend and bonus, £22,500; property tax, £618; Hull surplus profits transferred to reserve fund, £1952; Trowbridge surplus profits transferred to reserve fund, £120—making a total of £25,190, and leaving a balance, as mentioned above, of £47,129. The report and accounts having been adopted, resolutions were passed declaring a dividend at the rate of £1 per share for the half year ended June 30 last, clear of income-tax, and agreeing to the payment of a bonus of 2s. 6d. per share, free of income-tax. The retiring Directors (Colonel J. Wilkinson and Mr. J. S. Godfrey) and the Auditor (Mr. J. K. Corrie) were re-elected; and the meeting concluded with the usual complimentary votes to the Chairman (Mr. J. Horsley Palmer) and Directors, the Secretary (Mr. Frederic Lane Linging), and officers.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Wednesday—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY (Mr. W. F. Cotton) read the notice convening the meeting; and the Directors' report and the accounts (which were summarized in the JOURNAL last week) were taken as read.

The CHAIRMAN stated that the operations of the Company during the half year had been satisfactory. The quantity of coal carbonized was in excess of the corresponding period of last year by 2950 tons, and the gas made and delivered had increased in proportion. The Directors were thus enabled to recommend dividends at the same rate as before—viz., 10½ per cent. and 7½ per cent.—without infringing on the reserve fund; whereas at the end of June last year, they had to withdraw £8300 from the latter. The reserve fund was not yet up to the statutable amount; consequently they were not allowed to use the accruing interest on that fund towards dividends. The residual products showed an increase of £1500. This was in consequence of larger sales of coke at favourable figures. The prices paid for tar and sulphate of ammonia, on the other hand, had not been so good; but the Directors looked for improvement in both these articles. In anticipating the results likely to follow the working of the present half year, the Board felt confident that the dividend would be maintained. As mentioned in the report, the amount paid by the Corporation for the purchase of the lighting plant had been placed to the credit of the capital account; thus leaving a larger amount to the credit of unexpended capital. The Directors had not failed to use every exertion to extend the use of gas for other than illuminating purposes; and they had much pleasure in reporting a large increase in the sale and hire of gas-stoves. The facilities now offered by the Company for the use of gas for motive power had also led to a considerable increase in the use of gas-engines. The customers had been supplemented during the half year by 143. This was the short statement he had to lay before the shareholders; but he thought that it was a most satisfactory one. He concluded by formally moving—"That the report and statement of accounts be received and adopted."

Mr. LAWLER seconded the motion, which was at once unanimously adopted.

The CHAIRMAN then moved—"That a dividend at the rate of 10½ per cent. on the old shares, and 7½ per cent. on the new shares be now declared, the same to be payable on and after Oct. 10 next."

Mr. DRUMMOND seconded the motion, which was carried.

The proceedings then terminated.

EAST LONDON WATER-WORKS COMPANY.

The Past Half-Year's Working.

The half-yearly assembly of the proprietors of the East London Water-Works Company will be held to-day. The report which is to be submitted to the proprietors is a full one; and it opens with a comparative statement of the revenue and expenditure for the six months ending June 24 last. The revenue from all sources amounted to £137,387, as compared with £132,489 in the corresponding period of 1890—being an increase of £4897. The expenditure totalled to £60,542—divided as follows: Maintenance, £46,531; management, £13,331; and Chamberlain of London, £678. In the first six months of last year, maintenance absorbed £45,515, and management £8782—making together £54,297; being £6244 less than in the past half year. The increase of revenue, the Directors remark, may be deemed to be satisfactory; but it is more than absorbed by the additional expenditure arising from the heavy parliamentary expenses, increased cost of coal, the payment to the Chamberlain of London, and other items. The expenditure on capital account was £27,016; and this has been mainly incurred in the extension of works at Lea Bridge, which have been fully described in previous reports. These extensions are now nearly completed. The three new triple expansion engines have been started; and the economy in fuel is very marked. The yield of water from the Lea Bridge well and the tunnels therefrom continues to be satisfactory. The pumping machinery has been overhauled, and its capacity increased. The driving of the tunnels in the chalk is actively proceeding. The shaft of the Walthamstow well is completed, and is yielding a considerable volume of water. Tunnels will be driven in several directions from the bottom of the shaft as at Lea Bridge, for the purpose of collecting as large a quantity of water as the pumps are capable of lifting. A new well at Chingford Mill has been commenced; and, upon the whole, the expectations as to the future supply of water, both as to quantity and quality, will, it is believed, be fully realized. The quantity of water pumped was 8,312,788,783 gallons, against 7,551,630,687 gallons in the corresponding period of last year. The new services laid on numbered 1627. against 1736 last year; the total number now in supply being 170,810, The whole of the water delivered by the Company has been certified as clear and well filtered; and the reports of Dr. Frankland, the Government Analyst, as also those of Professor Crookes, Drs. Odling and C. Meymott Tidy, published from time to time in the official tables, further show that it is of good quality for dietetic purposes. Alluding to the Bills affecting the Water Companies introduced into Parliament, the Board state that these were referred to a Committee of the House of Commons, consisting of nine members, and presided over by Sir Matthew White Ridley. The Committee sat for twenty-one days; and after the evidence of the promoters had been taken, and speeches of Counsel delivered, they rejected both the measures, and made a special report to the House, suggesting, *inter alia*, that further inquiry should be made, with a view to a public authority being constituted (comprising the London County Council and other bodies), who should purchase the undertakings of the eight London Water Companies, and thus supersede them. Having regard to the provisions of the Bills and to the terms of a special instruction to the Committee from the House—viz., that "they have power to inquire into all matters connected with the nature, price, management, sources, and sufficiency of the water supply of London and its suburbs, and to insert in the Bills such provisions in connection therewith as in their judgment are expedient," it was impossible to foresee the direction or extent of the proceedings before the Committee. The Company had, therefore, at great cost, prepared full and satisfactory evidence both as to their position and prospects; but this evidence was not brought forward, owing to the Committee having declined to extend the investigation into the "sources and sufficiency of the water supply of London and its suburbs." The Company will be ready, however, to demonstrate, should the occasion arise, that in these and all other respects their condition is satisfactory, and that they have faithfully and loyally fulfilled every parliamentary obligation in the past, and are equal to meet the necessities of the future. The accounts show how seriously the Company have already suffered in regard to costs; but it was some satisfaction, at least, to hear the Chairman declare that "there was no accusation for the Water Companies to answer." The report also mentions that the first payment has been made to the Chamberlain of London under the East London Water-Works Act of 1886. The amount, calculated as provided, was £678 15s.; and this sum was applied "in purchasing and extinguishing" £308 of the ordinary stock of the Company, in accordance with the Act of Parliament. The Directors recommend that a dividend on the ordinary stock at the rate of 8 per cent. per annum (less income-tax) be declared, payable on Oct. 13. This will absorb £68,810; leaving an unappropriated balance of £9383.

Messrs. Kirkham, Hulett, and Chandler, Limited, have just received through their French agents (La Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of No. 29, Rue Claude-Vellefaux, Paris) an order for two "Standard" washer-scrubbers for the Paris Gas Company, each for 3 million cubic feet of gas per diem.

LEICESTER CORPORATION GAS AND WATER SUPPLY.

Half-Yearly Reports—The Electric Light.

At the Quarterly Meeting of the Leicester Town Council last Tuesday—the MAYOR (Alderman W. Kempson) presiding—the Gas and Water Committees presented their reports on the working of their respective departments during the six months ending June 30 last.

From the report of the Gas Committee, it appeared that the net profit, after paying interest on capital, was £14,936. Out of this had been paid £2762, being the half-year's amount of sinking fund; leaving a balance of £12,174 to be applied at the end of the official year (March 25 next). The net amount realized by residual products was £9217; and the half-year's working of the gas-fitting business showed a net profit of £150. During the half year, 50,693 tons of coal had been carbonized. The quantity of gas made was 524,518,000 cubic feet, as against 463,158,000 cubic feet for the corresponding half of last year; being an increase of 61,360,000 cubic feet, or 13·24 per cent. It was further reported that the new section at the Aylestone Road works, opened on Nov. 27 last, continued to work satisfactorily; the productive capacity amounting to 2,000,000 cubic feet per day.

Mr. LENNARD, in moving the adoption of the report, explained how the profits had been brought about in the face of difficulties, and said that, this being the last balance-sheet the existing Council would have to deal with, they might perhaps be forgiven if they reminded themselves and the public that, since the Corporation took over the works, the net profits had realized the magnificent sum of £306,899, of which £219,745 had actually been handed over for the relief of the rates—the other having been invested in the sinking fund, reserve fund, or handed back to the Gas Department in the way of renewal fund. This was apart altogether from a reduction in the price of gas from 2s. 10d., when the Corporation took over the works, to 2s. 4d. at the present time; and it should be remembered that 6d. per 1000 cubic feet meant a reduction of £25,000 a year. The profits looked enormous; but if they bore in mind the capital that had been sunk in the business, he did not think the yield was any too large, for he found that, reckoning the gross half-yearly profit at £28,464, it only represented 7·65 per cent. on the total capital.

Mr. BILLINGS seconded the motion.

Mr. SHIRES called attention to the enormous amount the Committee paid for interest on the current account—£895 for the half year. This represented something like an overdraft for the year of £36,000; but having regard to the extended borrowing powers of the Committee, he hoped there was a prospect that this would be done away with in the future.

Alderman WOOD replied that if they did not pay the bankers' interest, they would have to pay the amount on additional Corporation debt or sinking fund. It ought not to go forth that £800 would be saved. Mr. Shires knew very well that for two years past the Committee had been trying to increase their borrowing powers; and they hoped soon to do so at 3½ per cent., and do away with the bankers' overdraft. But they would have to pay the people they borrowed the money from; and they would then save to the extent of the difference between 3½ per cent. and the 5 per cent. they were paying, and no more.

The MAYOR thought the public would be sufficiently aware that any one doing business without capital must either pay liberally to his banker or to someone else; and the Gas Committee were unfortunately in that position. The Council were much indebted to the Chairman and the Committee for giving the time they did to the business.

The resolution was carried.

Mr. LENNARD, in reply to a question by Mr. Hollingworth, said the Committee had not lost sight of their responsibilities in the matter of the electric light, but were waiting to get the advantage of the experience of others. They knew their time was limited—fourteen months having expired out of the two years allowed them; but the time had not been lost, and they would be prepared to carry out their duties in the matter. Their Engineer (Mr. A. Colson) had taken note of all experiments—for they could only call them experiments—that were being made in certain towns; but the nearest approach to what they required for Leicester was the installation now being laid down in St. Pancras. This work would shortly be completed; and the Committee would then be able to see what could be done there, and profit by it. He did not know anywhere where electric lighting had paid. He knew there were a few companies that were paying; but they were not doing so by furnishing electric light—they did it through supplying fittings, &c. The Committee did not wish to rush into the matter too soon. He proposed shortly to invite the Council to visit the gas-works, when he would fully explain all he knew with regard to the electric light, and what he would suggest the new Council should do.

The report of the Water Committee was next submitted; and this showed that the net profit, after paying interest on the capital, was £7307. Out of this had been paid £2024 the half-year's amount of the sinking fund, leaving a net balance of £5283 to be dealt with at the close of the current financial year, in accordance with the provisions of the Transfer Act. Negotiations had passed between representatives of the Committee and the Earl of Lanesborough's solicitors, and also between the surveyors of the respective parties, with a view of the Corporation acquiring from Lord Lanesborough the land, water rights, pipe-lines, &c., required for carrying out the scheme authorized by Parliament last year, without having recourse to formal proceedings under the Lands Clauses Act—a procedure attended always by substantial cost, and almost invariably by protracted delay. The Committee regretted to have to report that they had not been successful in their efforts to settle the business, and that there was no prospect of their doing so. They recommended the Council to authorize the necessary proceedings to be taken to acquire the land (about 200 acres), and the water and other rights under the Local Act. The works authorized by the Council in October last, to enable them to carry out the arrangement with the Quorndon Local Board, had been completed, and the supply furnished within the time stipulated. Barrow-upon-Soar was, by the Local Act, placed within the limits of supply of the Corporation; and water was now being supplied, on the ordinary terms, to the inhabitants of that parish. Applications had been received from the Rural Sanitary Authority of Barrow-upon-Soar, to furnish a supply of water to Mountsorrel and Sileby. These parishes were not within the limits of the Corporation; but the Local Act contained a clause authorizing water to be supplied in bulk to local authorities outside the area of supply. The Committee were of opinion that it was not expedient to entertain the application at present.

Alderman WOOD first moved the adoption of the portion of the report embodying the balance-sheet. The Council, he said, would perhaps like to know something as to the state of the reservoirs and the present consumption of water. During the last half year, though the population on their books had increased at the rate of 3·19 per cent., they had had a decrease in the consumption of the water amounting to 2·20 per cent. This was partly due, he thought, to the shutting off of the water during the night at the time when they were in considerable peril of running short of water, and partly to the generous response on the part of the inhabitants to their request that they would be as careful as possible in their consumption. The average use per head of the population for domestic purposes was 12·2 gallons, and for trade purposes 5·26; or a total consumption per head of the population of 17·28 gallons per day. The condition of the reservoirs was not very satisfactory. The water was down below the weir at Thornton 3ft. 5in., and at Bradgate 5ft. 9in. This would probably be a surprise to the Council and to the public. Though they had had a large rainfall in August and July, they were decreasing the whole of the time; and this meant that the demand for water was greater than the rate at which it accumulated. The population they had to supply was one of 188,035; and every month they had an addition to that number. In August there was an addition of 460; and this was slightly below the average monthly increase, which was 500 persons. Their storeage at present was equal to 112 days' supply.

Mr. COLEMAN seconded the motion; and it was carried.

Alderman WOOD, in moving the adoption of the remainder of the report, said the difference between those who advised Lord Lanesborough and those who advised the Committee was so great that they had no alternative but to ask the Council to empower them to give notice to treat. He should have been glad if they could have, as they at one time hoped, obtained possession of the 200 acres and the water rights without this process; but the Council might take his word for it that they had left no stone unturned and had not come to ask them for this consent until they were compelled. The experience of the Corporation in the past with regard to like matters had been such as to give them little cause for regret that they had gone to arbitration. As to the time, he thought the Council, from the remarks he had made as to the condition of the reservoirs, and from the peril they were in last spring, would see that it would have been very unwise on the part of the Committee if they had delayed asking for this permission any longer. The town seemed to be growing very rapidly; and, in addition to this, they were called on to supply several other districts. They had at the present time invitations from other districts which they would have liked to supply, not so much for the profit of Leicester as for their benefit, but they had been reluctantly compelled to decline them.

Mr. COLEMAN seconded the motion, and said he did not think the Committee had come to the Council a day too soon. The state of the reservoirs had been a serious anxiety to them; and their present condition showed that the consumption was in excess of their supply, even in this very wet summer.

The motion was carried.

AN ABERDEEN TOWN COUNCILLOR AND THE GAS MANAGER.

As stated in our Edinburgh Correspondent's "Notes" last week, a dispute has arisen between Mr. A. Smith, the Manager of the Aberdeen Corporation Gas-Works, and Mr. Pratt, a member of the Town Council; the latter alleging that Mr. Smith made use of offensive language to him in the gas-works on the 14th of August last. At the last meeting of the Town Council, a Committee, consisting of Lord Provost Stewart, Captain Taylor, and Mr. Scott, was appointed to try to heal the difference. The Committee have met with the parties, and have been unsuccessful; and they have published an authoritative account of their proceedings, which, as the affair raises a question of considerable interest to gas officials serving under Corporations, we give in full, as follows:—

The Committee resolved, at the outset, that it must be fully kept in view that the dignity of the Town Council and its members, and their authority over the Council's employees, must be fully maintained, and that if Mr. Smith had been guilty of using the language attributed by Mr. Pratt to him, his conduct at the least merited a severe rebuke. They judged, however, that even in accordance with strict legal principle, apart from equity, they ought to take into view the whole circumstances surrounding and leading up to the incident in question, with the view of considering whether there had been any justification or excuse afforded by any conduct or action on the part of Mr. Pratt towards Mr. Smith. Mr. Smith was therefore seen, and made an explanation, and following upon that the expression of regret contained in the following letter:—

Sept. 25.

My Lord Provost,—In regard to the dispute with Mr. Pratt, I have to remind your Lordship that he interfered with a matter in which I had been appointed sole arbiter between your Council and a contractor, and that in a way most offensive to myself. Though he was utterly mistaken, the matter was communicated to the newspapers in a paragraph headed "Mysterious Delivery of Machinery at the Gas-Works." The Committee met in consequence, and found that there was not the slightest ground for what Mr. Pratt had conceived to be the case, and declared their opinion that the newspaper paragraph emanated from him. I was naturally very indignant at this behaviour regarding a matter which affected my personal reputation; and though I repudiate the language he attributes to me, I may have expressed myself too strongly on the occasion when I met him at the gas-works subsequently, and I beg to assure your Lordship and the Town Council that I regret very much having done so. I think, however, before using this letter in any way, a similar expression of regret should be obtained from Mr. Pratt.—Your obedient servant,

(Signed) ALEX. SMITH.

At a meeting on Saturday, Sept. 26, the Committee resolved to meet with Mr. Pratt, and explain to him that Mr. Smith had stated that he was naturally very indignant at the newspaper paragraph referred to; and they considered that, if Mr. Pratt were the author of the paragraph, a palliation and excuse was thereby constituted with reference to Mr. Smith's conduct. They therefore interrogated Mr. Pratt as to the authorship, whereupon he simply stated that he would neither admit nor deny it; but he added that the paragraph might have reached the newspapers through him. In response to further inquiries, he stated that he had got information from persons who had been watching the gas-works at the time in question; but he refused to give any information regarding those parties. The Committee considered that Mr. Pratt's refusal to supply the information referred to precluded them from giving that consideration to the whole circumstances which the case demanded; but, after communicating with him, they suggested that they would endeavour to get Mr. Smith to make his apology public, if Mr. Pratt would grant an acceptance of it in terms similar to the following:—

Referring to our meeting to-day, when it was explained to me that Mr. Smith was under the belief that I was responsible for the paragraph headed "Mysterious Delivery of Machinery at the Gas-Works," which appeared in a local newspaper on the 13th of August, 1891, and that the statements therein had caused him natural irritation, labouring under which he admits having used language to me for which he expresses regret, I beg to say that, for my part, I am now satisfied with Mr. Smith's explanation, and that the incident may terminate. I, of course, reserve my full liberty of criticism as a councillor on Mr. Smith in his official capacity.

Mr. Pratt seemed to consider that he would be committing himself in some unexplained way if he signed any such letter; and he requested time to consider his position. This the Committee accorded him, and adjourned from Saturday till yesterday [Tuesday] to await his answer. Meantime, a paragraph, professing to give an account of the private procedure of the Committee, which was not supplied by either the Lord Provost, Captain Taylor, or Mr. Scott, appeared in the newspapers of Monday, the 28th of September; and the Committee, being able to arrive at only one conclusion as to the authorship of that paragraph, felt that Mr. Pratt's conduct thereanent (the inquiry being still *sub judice*), must be considered along with the previous circumstances. On the Committee meeting yesterday, Mr. Pratt stated that, after having taken advice, he declined to sign the proposed letter; that he considered the public were on his side, and deeply interested in the question; and that the public would not be satisfied with anything short of a full and ample apology from Mr. Smith, admitting the language which Mr. Pratt attributed to him without there having been a semblance of palliation or excuse in any conduct of Mr. Pratt's. The Committee, considering this expressed resolution of Mr. Pratt, and seeing that their action had been practically stultified by Mr. Pratt's declining even to give his own version of the circumstances surrounding the newspaper paragraph complained of by Mr. Smith, &c., and considering also Mr. Smith's proffered expression of regret in the terms set forth, came to the conclusion that it was not incumbent upon them to take any further action in the matter beyond publishing the above statement.

With reference to the last paragraph in Mr. Smith's letter, as quoted above, the Lord Provost and Mr. Scott advised Mr. Smith that he should now allow this letter to be published, as above; but Captain Taylor, while concurring generally in the Committee's finding, considered that, in view of the unfair position taken up by Mr. Pratt, no apology was now called for.

On the succeeding day [Thursday], Mr. Pratt published a letter, nearly a column in length, in the local newspapers, in which he "claimed to give his version." Mr. Pratt's narrative is too long to be reproduced here; but in it he maintained that the paragraph as to the alleged mysterious delivery of machinery at the gas-works had no bearing on the question in dispute. His account of what occurred at the works, and which is the only account that has yet been given to the public, is as follows: Mr. Smith then turned round on me and said, "In the presence of Bailie Duff, Councillors Thomson, Collie, and Findlay, "It's all owing to that d——l Pratt; I'll double you up and lay you low." I said, "You had better take care, Mr. Smith," and again he said, "You thing; I'll lay you low and double you up." I replied, "You would have to raise me up again." "No," he said, "I would leave the next fellow to do that." Further on, Mr. Pratt says, referring to the document which the Committee asked him to sign: "Fortunately, I did not get trapped by them, as the more I looked at the document, the more I saw the absurdity of my putting my signature to such a thing. As I told them on Tuesday, the 29th ult., I had done nothing which I should regret, even as to the investigation of the machinery; and that had I the same to do again, I would follow the same course, as it was for the best interests of the public I so acted. All I desired was an apology, as I privately requested from Mr. Smith by letter on the 2nd of September; and, so far as I was concerned, the matter would then have ended."

Enlargement of a Gasholder at Halifax.—The Engineer of the Halifax Corporation Gas-Works (Mr. T. Holgate), having had a great deal of trouble with one of the gasholder tanks at the Stoney Royd works through the incoming of water from the hillside, advised his Committee to have it repaired, and to take the opportunity of increasing the capacity of the holder. This has been done; and it is said that the extension makes the holder the largest in Yorkshire. On the invitation of the Gas Committee, the members of the Corporation were present at the "inauguration" of the holder last Friday week. After the ceremony, the Chairman of the Gas Committee (Mr. Broon) entertained the company to luncheon in the engine-room; and subsequently, in proposing "Prosperity to the Undertaking," he remarked that he believed the difficulties with which the Committee had had to contend had been overcome, and the works were now sufficient to supply all the needs of the town during the coming winter. He also referred, in complimentary terms, to the services of Mr. Holgate, especially mentioning that it was on his recommendation that the repairs and enlargement of the holder had been carried out.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

At the Meeting of the London County Council last Tuesday—Sir J. Lubbock, Bart., M.P., in the chair—the Special Committee on Water Supply, &c., of which Sir T. H. Farrer is Chairman, presented a long report on the subject of the proceedings in Parliament last session on the Bills promoted in connection with the water supply of the Metropolis, and on the position of the Council in regard to the Metropolitan Water Question generally.

The Committee open their report by briefly setting forth the objects of the London Water Commission Bill, the Metropolis Water Supply Bill, and the London County Council Bill; and they then proceed to explain the action of the Council thereon. In the first place, the Council communicated with the Water Companies with a view to entering upon negotiations for the purchase of their undertakings; but they received answers which did not encourage them to proceed. They declined to hold any such public inquiry as had been held by the City, because it was not in their power to compel the Companies to submit evidence, and because it was essential in a public inquiry that all sides should be heard; but they proceeded to procure the best information in their power. Shortly stated, this information, as supplemented by further inquiry, was to the effect: (1) That the population supplied by the Water Companies has increased in a proportion far greater than has been anticipated. The Commission of 1869 regarded 4,500,000 to 5,000,000 as the outside number of the population to be supplied, and this only at some very remote period; whereas in fact the number has reached 5,500,000 in 20 years. (2) That the quantity of water passing down the Thames is less than was expected, especially in dry seasons; and that the quantity abstracted by the Water Companies is from 50 to 60 per cent. more than in 1867. (3) That, so far as further supply is concerned, the River Lea is exhausted. (4) That, as regards wells in the districts around London, the supply is limited, and is claimed by the inhabitants of those districts. (5) That there will be great difficulty in making reservoirs in the Upper Thames. (6) That, according to the reports of the Government officials and others, it will be difficult, in face of the growing population of the valleys of the Thames and Lea, to secure immunity from dangerous pollution. (7) That the water-bearing areas of England and Wales are being rapidly appropriated by the growing populations of the great towns. In consequence of this information, and especially of a report by their Engineer (Mr. A. R. Binnie, M. Inst. C.E.), the Council, on the 9th of December last, passed a unanimous resolution authorizing an immediate application to the Government on the question of a new supply. In pursuance of this resolution, a letter was addressed by the Chairman of the Council to Lord Salisbury on the 12th of December last; but, beyond a bare acknowledgment, no reply was given thereto. The Committee next review the proceedings of the Committee appointed by the House of Commons to consider the Water Bills; and they give the text of the Committee's report, which appeared in the Journal for July 21 last (p. 123). On this the Committee make the following observations:—

Looking to the action and report of the Select Committee, it is not very easy for the Council to understand distinctly what course they should pursue in order to comply with its requirements. On the one hand, the Select Committee have, by their rejection of the proposals for a new Municipal Water Trust, and by their emphatic and repeated recommendations that the Council should undertake, either by themselves or in connection with the City Corporation, the whole responsibility of inquiry, and of forming a conclusion as to the policy which it may be desirable to adopt concerning water supply, intimated, in apparently explicit terms, their opinion that the Council, as representing the ratepayers, is the proper body to be entrusted with complete powers for preparing a scheme or schemes to settle the water question. On the other hand, by their resolution of the 28th of April, refusing in terms to pass any Bill simply constituting a water authority, with power to promote Bills in Parliament, and by their refusal to consider or pass the City Bill as amended—a refusal which would have been equally fatal to the London County Council Bill if it had been before them—they have distinctly declined to take the only step towards these objects which was possible in the late session. And by their third recommendation, which imperatively requires the Council, as a condition of becoming a water authority, to purchase within a fixed period, by agreement or arbitration, all the undertakings of the Water Companies, they not only anticipate the result of the inquiry which they desire the Council to make, to the possible exclusion of the most important factor in the estimate of value, but dictate to that body a conclusion which is directly contrary to the deliberate policy of the Council as laid before them by the Council's representatives. Upon the all-important question of a new supply, there is equal difficulty in drawing any distinct and positive conclusion from the report of the Select Committee. That Committee, while stating that time would prevent them from examining into, and reporting upon the quality and quantity of the present supply or the means by which an additional supply might best be obtained, also intimated that no more water should be taken from the Thames than is at present authorized. This was clearly the inclination of their own opinion; but they withdrew any official intimation of it on its being pointed out by the Counsel for the Companies that the Companies had not given evidence on the subject. Again, the report clearly indicates the question of new supply as one of the questions to be examined by the London County Council. But the Committee have given the Council no facilities for this inquiry; they have removed none of the difficulties under which the Council labour; they have refused to pass a Bill which would have placed the Council, acting in harmony with the City, in a position to deal effectually with the question; and they have hampered the action of the Council in the matter by the recommendation that they shall be obliged to purchase the undertakings of the Water Companies before they can place themselves in a position to deal effectually with this subject. And, further, the Committee clearly incline to the opinion that a fresh supply will, or may, be necessary, and that London may have to go to Wales or to some distant region for such a supply; for, in addition to the intimation above referred to, they suggest in

their report that Parliament will do well to hold its hands in appropriating fresh sources of supply until the wants of London and other large populations have been fully considered. At the same time, in rejecting, by a majority of one, Mr. Lowther's amendment,* they have declined to recommend the course best calculated to bring the question to an early settlement, and they leave the subject in a very unsatisfactory position. Their recommendation with respect to the future action of Parliament clearly points to the case of Birmingham, which town, as was shown to the Committee, is coming to Parliament next year with a scheme for appropriating one of the best remaining sources of supply in the country—viz., a mountainous district in Mid-Wales. This involves the Council in serious difficulties. To leave Birmingham unopposed may be to lose the chance of an excellent source of supply for London. To oppose Birmingham without any definite scheme for occupying the ground which Birmingham proposes to appropriate, will be both invidious and difficult. The Birmingham case is one which presses for immediate decision. But putting that case aside, and regarding the question as a general one, nothing can be more unsatisfactory than to leave the appropriation of the few remaining areas in England which are capable of affording a good water supply, to a scramble between different local authorities, conducted by the hap-hazard and piecemeal method of separate proceedings before fortuitous Private Committees, appointed to consider the local, partial, and necessarily imperfect schemes which different towns, according to their needs, may at various times bring before Parliament. Under such circumstances, it is impossible to treat the report of the Committee as if it were, like the report of Sir W. V. Harcourt's Committee of 1880, a document indicating authoritatively a clear and certain policy; and it must be for the Council, in endeavouring to discharge the functions which the Select Committee clearly intended should be imposed on them, to do so with discrimination, and to reject any conditions or restrictions which appear to be at variance with the main intentions of the Committee and with the best interests of London.

The remainder of the report deals generally with the position of the Council in regard to the water question. It is as follows:—

In discharging their duties in respect to the water question—duties which are emphasized, if not extended, by the report of the Select Committee—the London County Council have been, and still are, hampered by the following difficulties:—

1. Their powers of proceeding by Private Bill are, to say the least, extremely doubtful.

2. They have no power to spend money on any inquiries or on any scheme, beyond the £5000 which they are authorized to spend under the Act of 1890, of which the greater part is already spent.

3. They have no power to call for evidence or information either from the Companies or from any other persons. The Companies cannot be expected to furnish such information to a body which they regard as a possible statutory purchaser, or even as a competitor; and the Council are obliged to rely on the evidence of their own experts, and on such other information as they can obtain. This is the more important, since the course of events from 1880 to the present time has been such as to enable the Companies, while informed of the case of their opponents, to keep back their own. In 1880, Sir W. Harcourt's Committee had before it the evidence of Mr. E. J. Smith, the valuer or arbitrator appointed by Lord Cross; and this evidence was such as to make it unnecessary for the Companies to produce any evidence of their own. In 1890 the Companies declined to give evidence to the Committee of the City Corporation; and they adopted a similar line when applied to by the Council. The Select Committee of last session no doubt had powers which, if the inquiry had been complete, would have compelled the Companies to state their case. But the Committee stopped the inquiry before hearing the evidence of the Companies; and the Companies have, therefore, had the advantage of hearing the case of their adversaries, and of cross-examining some of the adverse witnesses, without stating their own case or exposing their own witnesses to cross-examination. It is scarcely necessary to point out how much this adds to the difficulties of the Council, especially on the all-important question of a new supply. However strong may be the evidence that such a supply is, or will soon be, required, it is impossible to rely upon it as strongly as if the Council had before them all the evidence which the Companies can produce on the other side; and the Council are exposed to the risk, in case of future contests in Parliament or eleswhere, of having new points sprung upon them without having the time or means of duly considering or criticizing them.

4. It is obvious that the result of any inquiry the Council may make under such conditions cannot be final or conclusive. The Council and the City Corporation are representatives of the ratepayers within the municipal areas covered by their respective jurisdictions; and they have, of course, to that extent, interests opposed to those of the Water Companies, while they have no power to represent or bind the authorities and populations outside their own area. Their concluions, therefore, may not command assent by any of these bodies, and will probably be hotly contested by the Companies. The inquiries which they may make will in all probability in the end, have to be repeated by, or before, some independent authority; and while time will thus be lost by the course indicated in the Committee's report, little will be gained. It was to avoid this loss of time, and to procure the decision of an independent authority at the earliest possible period, that the Council in December last applied to the Government to institute an impartial and independent inquiry—an application which the Government not only did not grant, but did not even answer. It was no doubt with the same objects that the rejected amendment of Mr. Lowther was supported by a minority of the Committee.

Of these four difficulties the first and second might have been removed if the Government had given assistance towards a second reading of the Council's Bill, and if the Select Committee had passed that Bill. They might also have been removed if the Select Committee had passed the City Bill as altered by agreement with the London County Council. The fourth, and to a large extent the third, of these difficulties, would have been removed if the Government had acceded to the application of the London County Council for an independent inquiry; or if the Select Committee of last session had been appointed at such time and in such manner as to be able and willing to undertake the inquiry into new sources of supply. But the Government, as above stated, did not even answer the application of the London County Council; and the Select Committee not only would not or could not enter upon the inquiry themselves, but, by a majority of four to three, declined to recommend that the Government should undertake such an inquiry. The consequence is that all the above difficulties are left untouched, and that while the Council are saddled with such increased responsibilities as arise out of the recommendations of the Select Committee, they have no means placed in their hands wherewith to discharge them.

It is desirable that Londoners should understand this, and that they should also understand that the effect of the refusal of the Government to entertain the application of the Council, the delay in the appointment of the Select Committee, and the inability or unwillingness of that Committee to enter upon the question of a new supply, have had the effect of postponing the whole question for a year at least—a postponement and loss of time which, having regard both to the increase of rates, and also to the growing difficulty of finding new sources of supply, is much to be regretted.

But this is not all. If there was one point on which the policy of the Council was distinctly expressed, both in their own resolutions and by the evidence of their witnesses before the Select Committee, it was that inquiry into new supply must precede purchase, and that fair terms of purchase could not be settled until that inquiry was completed. The third recommendation of the Select Committee insists on purchase as an absolute and apparently preliminary condition. Now, if this recommendation could be taken to mean that the Council, before undertaking to supply the whole of London with water, should do their utmost to come to a fair arrangement with the Companies by paying to them the full real value of their undertakings, no reasonable man would object to it. But looking to the action of the Committee in passing their resolution of the 28th of April ["that no Bill can be satisfactory, deal ng with the questions referred to this Committee, which merely constitutes a public authority to promote Bills in Parliament"], to their rejection of the City Bill as amended in concert with the Council, and to the actual terms of their third recommendation, it is to be concluded that, by this recommendation, they intended to prevent the Council from obtaining any parliamentary powers or any legal position whatever with respect to the water supply of London, unless they were first placed under statutory obligation to buy up the whole of the Companies by agreement or on arbitration terms, and to complete such purchase before the vital question as to whether large capital outlay for a new supply will or will not be required in the early future is authoritatively determined.

Assuming this to be the meaning of the Committee, it is, as pointed out above, obviously inconsistent with their own previous recommendation that the Council shall have a free hand in the inquiry concerning the policy which it is desirable to pursue. That policy may be to deal with all or with some of the Companies; to procure a new supply themselves, or to compel the Companies to provide a new supply. It is quite obvious that the Council cannot investigate these points with any freedom, or with any prospect of a successful result that would be fair to the ratepayers of London, if the Council are hampered by the condition that they must at once buy up the whole of the Companies' undertakings by agreement or on arbitration terms.

The recommendation of the Committee is also entirely at variance with the policy which the Council have themselves adopted in approving the reports of the Parliamentary Committee on the Bills of last session—a policy which was distinctly and repeatedly stated to the Select Committee by the Council's representatives and witnesses. All that has since transpired confirms the soundness of this policy. It has been shown, for instance, by the figures of the Government Auditor, that, if the arbitration terms made by Mr. Smith, and adopted by Lord Cross in 1880, had been sanctioned by Parliament, the inhabitants of London would have had to pay to the shareholders of the Companies much more than they have actually paid. The annuity which Mr. Smith, the Government arbitrator or valuer, would have given to the shareholders in 1890 was £1,056,218; while the actual profits received by the same shareholders in 1890 was only £838,347—showing an excess of the valuer's estimate over actual profits of £217,871. The aggregate of Mr. Smith's annuities to the shareholders from 1880 to 1890 would have been £9,555,719; while the actual profits earned by the same shareholders during that period have been £8,498,180—showing an excess in Mr. Smith's estimate of £1,057,539. Further, Mr. Smith's annuities would have been in Metropolitan Stock, which is, of course, a much better security, and much more valuable, than the stock of the Water Companies. Various circumstances have led to this result—*e.g.*, Mr. Dobbs's successful litigation and the Act of 1885—all of which are circumstances which ought to be considered in determining the value of the Companies' undertakings. But the most important of the causes of the actual profits of the Companies being less than the estimated value was pointed out by Sir W. Harcourt's Committee—viz., that Mr. Smith, while taking into consideration both the existing and prospective income of the Companies, did not take into consideration the large capital outlay which the Companies would be likely to incur, and which, even without any new sources of supply, they have actually been compelled to incur. In further illustration of this, it may be mentioned that it has been shown, by the evidence of the Chairman of the Southwark and Vauxhall Company this year, that the shareholders of that Company are, by the expenditure of new capital to the extent of £300,000, which was sanctioned in 1886, large losers every year unti 1905, and the losses thus sustained will not be recouped until 1924.

But the outlay which the Companies have already been compelled to incur on comparatively small matters—*e.g.*, in providing pumping power, new or extended mains, or new filtering-beds—is as nothing compared with the expenditure they would have to incur in providing a new or a largely increased supply, whether that supply be provided by bringing water from a distance—say, from Wales or Dartmoor—or by making new and extensive reservoirs in the valleys of the Thames

* This was an amendment to paragraph 8 of the report, to the effect "that a Royal Commission, composed of specially-qualified scientific members, should be appointed to consider how far, if at all, the supply at present derived from the Thames and Lea, and the springs and wells in the Metropolitan water area, should be limited or extended."—Ed. J. G. L.

and Lea. All such expenditure must, if the Companies continue to supply London, come out of, or be charged on, the rates which the Companies are now entitled to levy; for it is not to be supposed that Parliament will increase their rating powers, and such expenditure must therefore *pro tanto* diminish the divisible income and real value of the Companies' shares.

It is therefore quite out of the question to determine what is the value of each or any of the Companies' undertakings until we know what that Company would need to spend upon a new supply; and it is quite impossible to determine what this amount would be without a previous inquiry both into the present sources of supply and into the nature and cost of any new sources which may be necessary to replace or supplement them. Such questions are obviously beyond the province of any arbitrator. To prove this, it is only necessary to state what these questions would be: (1) What will be the future demands of London and its surroundings, in view of its continuous and rapid increase of population? (2) Are the present sources of supply of each Company sufficient in quantity for a reasonable period of years? (3) Can the present sources of supply be relied on as satisfactory in respect of purity, having regard to our present knowledge of the infection arising from polluted water supplies, especially during choleraic and other epidemics? (4) If the present sources are insufficient or cannot be relied on, whence are new sources of supply to come? (5) If from wells, will these afford a sufficient supply, and will the people living in the areas in which the wells are situate submit to have their water taken for London? (6) If from storeage reservoirs in the valleys of the Thames and Lea, where are such reservoirs to be constructed? (7) If it be found necessary to obtain a new supply from a distance, then from what part of the country—from Wales, or Mid-England, or Dartmoor, &c.? (8) Will Parliament give powers for any, and which of such schemes, and on what terms? (9) What will such schemes cost? It is obvious that questions such as these cannot possibly be determined by any arbitrator; and yet they will have to be determined before it is possible to know what ought to be paid to the Companies. Such questions can only be settled either by a municipal authority armed with full powers for the purpose, or, still better, by some independent tribunal aided by the Municipal Authorities as well as by the Companies.

There are other matters which can scarcely be dealt with by arbitration, but which yet seriously affect the value of the Companies' undertakings. For instance, there is, in the first place, the question whether the Companies can maintain all their present charges, if those charges are disputed at law. Their rating powers are various and ambiguous; and there is reason for believing that, when they were granted, it was never intended that they should be stretched to the uttermost. It is notorious that in the Dobbs case certain claims made and enforced by the Companies were held to be illegal. The same thing may happen in other cases. Again, there is the question whether the Companies' rating powers may not be cut down by Parliament. This has already been done to some extent by the Water-Rate Definition Act, 1885; and the recent action of Parliament in the case of railway rates shows that statutory rating powers are not unassailable where the case is such as to justify a statutory change. And, surely, if there ever was such a case, it is to be found in the law which makes the charges of the Companies to increase, not in proportion to the cost to the producer or the benefit to the consumer, but in proportion to the increased and increasing values which, under the Metropolis Valuation Act, are every five years placed on London property. Further, there is the question of competition. The Companies have, as is well known, no legal monopoly; and the principal difficulty in competing with them is due to the great cost which must be incurred in providing alternative mains and fittings. But these are difficulties which the ratepayers might well, under certain circumstances, think it right to face, especially if a new supply be brought to London at their expense. All these are matters which an ordinary arbitrator would be unwilling, and probably unable, to deal with. As a matter of history, Mr. Smith, in the valuation made by him for Lord Cross in 1880, did not take them into account at all; and yet subsequent experience distinctly shows that he was wrong, for, since 1880, litigation and legislation have actually restricted the then existing charging powers of the Companies, and have thereby reduced their dividends and the value of their shares. To leave such matters out of account in valuing the undertakings for purchase, would be unduly favourable to the Companies, and unjust to the purchasing ratepayers; but they would almost certainly be left out of account if the purchase were conducted on ordinary arbitration terms.

The Companies will, no doubt, desire, as they did in 1880, that London should buy them on the footing of their present dividends, or of their present Stock Exchange value, without reference to their future liabilities, and especially without reference to the question of a new supply; but to do this would be to make London ratepayers pay the Companies as if their present supply were inexhaustible and unimpeachable, and then, in all probability, to make the same ratepayers pay enormous additional amounts for supplementing that supply. It is no exaggeration to say that London might, in this manner, be made to pay from 30 to 40 millions in purchasing the undertakings of the Companies, and might then find itself obliged to spend from 10 to 20 millions more in providing a new supply. This would probably be the result of an obligatory immediate purchase on arbitration terms; and such a purchase must therefore be resisted at all hazards.

It has been persistently urged that parliamentary precedents all point to the acquisition of the undertakings on these terms. But parliamentary precedents, even if they could be proved to be uniform, which is very doubtful, are not, like judicial decisions, binding in subsequent cases; and a policy which may have been adopted in the past will not necessarily be adopted in other and future cases, if justice and expediency require a different course.

From what has been said, it seems that the conclusions of the Committee upon the City Bill, both in its original form and as amended, coupled with their recommendations concerning purchase, amount, in effect, to a decision that nothing whatever shall be done to forward the solution of the London Water Question until arrangements are made for buying up every one of the Companies' undertakings, either on the Companies' own terms or on arbitration terms. Such a decision is fatal to the action of the Municipal Authorities; for it is impossible for them, unless duly constituted for the purpose, and endowed with sufficient powers to procure the necessary information, to complete the requisite inquiries, to spend money on plans, to enter into effectual negotiations, or to bring Bills before Parliament. It is at the same time absolutely unnecessary for any fair and reasonable protection of the Companies' interests. If the Council, or, as is now proposed, a body on which the City as well as the Council is represented, were created, and endowed with all the powers which have been asked for, it must, after preparing its plans and formulating its proposals, submit them to the decision of Parliament. Such a body could not levy rates, borrow money, break up streets, purchase land, commence works, bring water to London, supply houses, or do any act whatever interfering with the Companies except by Bills in Parliament, upon which the Companies would have full opportunities of being heard. Under these circumstances, there seems to be no reason whatever for the recommendation of the Select Committee requiring purchase as acondition precedent to further action. Such a condition ought to be, and will no doubt be regarded by London ratepayers, not as a step towards a fair arrangement with the Companies, but as a needless and unjustifiable outwork of the Companies' claims to monopoly, and an equally needless and unjustifiable impediment to any efficient action on the part of the representatives of the ratepayers.

There is a further reason why the Municipal Authorities of London should not be hampered by the condition contained in the report of the Select Committee. One fact elicited and illustrated by the recent proceedings is the great and growing importance, positive and comparative, of what may be called the exterior ring of the Metropolitan population. The population of the outside circle of the Metropolitan area itself is growing faster than that of the centre; and the population of the suburban districts outside that area is growing in a still larger proportion. These populations are, to a great extent, within the areas of supply of the present London Water Companies; most of them have municipal organizations of their own; their demand for water is increasing; and the experience of last session shows that some of them at any rate will demand, with much reason, the management of their own water supplies. It also shows that they will urge, probably with success, claims to have the water procured within their own areas applied in the first instance to the wants of their own populations, and will resist attempts, either by the Water Companies or by the proposed Joint Committee (if it should become the owner of the undertakings of the Companies) to divert the local water supplies for the purpose of supplementing the wants of London. Kent, Essex, Hertfordshire, Middlesex, and Surrey—not to mention more distant counties, such as Oxfordshire, Buckinghamshire, and Berkshire—will not passively allow their springs and streams to be exhausted, or their wells to be lowered, in order that the present Companies, or their successors, may supplement the present supply of water from the Thames and the Lea by an extended system of pumping from the chalk and the greensand outside London.

These facts greatly increase the complications of the subject. They show that, in any dealings with the Companies, the claims of these outside areas will have to be fully considered. If the authorities of those areas are to obtain possession of sources of supply which are now available for London, they must pay for them; and consequently they will claim a voice in determining what the payment shall be. Further, the circumstances and relations of each district of local government and of each Company differ; and separate and independent arrangements will have to be made in each case. The wells of the Kent Water Company, for example, are probably more productive, and can supply a larger area and a more growing population, than the wells or other sources of the northern and western Companies. If so, they are more valuable; and if the authorities in the county of Kent desire to appropriate them, they must pay the more for them. Again, the arrangements of the Council with the different outside authorities will probably be very numerous and very different. In some cases it may prove desirable, as above intimated, to hand over the local supply to the authorities of the area of such supply, and to dispense altogether with this part of the supply in providing for London. In other cases it may be desirable to do as has been done in the case of the great towns in the North—viz., to provide for the supply of the outside districts by the central authority either by selling water in bulk to the local authorities of those districts on terms to be arranged with them, or by supplying the householders in those districts direct on payment of certain rates. In all these cases, it will be necessary to make careful and distinct arrangements, which will vary according to the circumstances of each undertaking and each district.

Now if, under such circumstances, the Municipal Authorities are to be bound to buy up all the Companies immediately upon becoming a Water Authority for London, it would be almost, if not quite, impracticable for them to make the requisite arrangements with the authorities of the outside areas in such a manner as would be fair both to London ratepayers and to the inhabitants of those areas. If the outside areas are to be dealt with in such a manner as to do justice both to them and to the London ratepayer, the municipal authority which is charged with the investigation and conduct of this question must enter upon the whole business without having its hands tied as proposed by the Select Committee, and must have power to make such arrangements with each district, and with each Company, as the circumstances of each district and of each Company may require.

It is obvious that, besides the question of immediate purchase, there are many others of great importance to be considered. These we are now considering; and we will report upon them to the Council as soon as possible. But the question of compulsory purchase, as a condition of further progress, is one on which it is desirable that the Council should express an early and decided opinion; and, under these circumstances, we submit, and recommend the Council to adopt, the following recommendations: (1) That the Council, while expressing its readiness so far as its legal powers enable it to do so, to undertake the duties and obligations mentioned in the first, second, fourth, and fifth recommendations in paragraph 5 of the report of the Select Committee, is unable to accept the condition contained in the third recommendation—that the Council, if constituted the Water Authority, should be required to purchase the undertakings of the eight Water Companies "by agreement, or, failing agreement, by arbitration, within a fixed period."

(2) That the Council is prepared to accept and act upon the following recommendation contained in the report of Sir William Harcourt's Select Committee on Water Supply, viz.—"That, for certain purposes at least, it would be desirable to acquire the undertakings of the existing Companies, if the same could be obtained on fair and reasonable terms." (3) That the Council is of opinion that the price to be given for the undertaking of any Company should depend, not merely on past dividends or on Stock Exchange values, but upon the true value of the undertaking, having regard to its legal position and liabilities, to the condition of the property, and to its ability to supply future wants. (4) That, in order to arrive at a satisfactory conclusion on this last question, it is essential, before any terms of purchase can be considered, that the liabilities to capital expenditure for new or supplementary sources of supply in the immediate future should be authoritatively ascertained.

The consideration of the report was deferred.

ASSOCIATION OF MUNICIPAL AND COUNTY ENGINEERS.

The Water Supply, Sewerage, and Electric Lighting Works of the Dublin Corporation.

The Annual Conference of the Incorporated Association of Municipal and County Engineers (of which Mr. T. Cole, Assoc. M. Inst. C.E., is the Secretary) was held in Dublin on Saturday, the 26th ult., under the presidency of Mr. T. De Courcy Meade, Assoc. M. Inst. C.E., Surveyor to the Hornsey Local Board.

The President, in opening the proceedings, briefly explained the objects for which the Association had been established. He said it was formed some twenty years ago; and three years since it was incorporated, when its scope was considerably widened. County surveyors and other engineers, who were not originally included in those eligible for membership, were admitted; and he was pleased to say that the numbers had augmented, and the interest felt in the work of the Association had extended not only through Great Britain and Ireland, but also to India, China, America, and, indeed, he might say to all parts of the world. The Association was established by a few municipal engineers who felt the want of some organization that would give them an opportunity of meeting together, interchanging opinions, and discussing such subjects as were of interest to them as a body. Municipal and county engineers were very important officers in their respective districts. The municipal engineer, unlike the medical officer (who tried to cure after disease had broken out), struggled to prevent the diseases to which people were liable from bad sanitation, inferior water supply, and the other troubles they had to contend with in towns; and he had, it was gratifying to find, so far succeeded during the last 20 or 30 years that the death-rate in England and Ireland had been materially reduced.

Mr. Spencer Harty, the City Engineer, then read a paper entitled "Sanitary and other Works carried out by the Corporation of Dublin." At the outset, he briefly touched upon the improvements carried out by the Dublin Municipality some centuries ago; and pointed out the existence, under a Charter of Edward II. (1322), of a permission whereby the Mayor, bailiffs, and citizens were permitted to levy customs on certain goods in aid of paving the city. This was equivalent to the modern improvement rate; and it was followed by other Charters for a similar purpose. The first great sanitary work of the present Corporation was the water-works. For upwards of 600 years the water supply was taken from the Dodder; and even at the present day this water was utilized for extensive trade supplies. Continuing, Mr. Harty gave a brief description of the water supply. The originating of the site was, he said, due to Mr. Richard Hassard, a Dublin engineer, at present residing in London; but the works were carried out by the late City Engineer, Mr. Neville, whom he (Mr. Harty), as well as others, assisted. He then furnished the following particulars: The Vartry stream rises at the base of the Sugarloaf Mountain (on its southern side), in the county of Wicklow, at an altitude of about 1050 feet above Ordnance datum, and flows from north to south a distance of five miles to the commencement of the impounding reservoir, situate under the village of Roundwood; passing altogether through pastoral lands. On its route to the reservoir, it receives the addition of tributaries, some of which are larger than the main stream itself. The geological formation of the ground is the Cambrian and Lower Silurian. The water is pure and soft, very much akin to that of Loch Katrine; the degree of hardness being about 1·6 before boiling—Loch Katrine being about 1·9. The works were commenced in the year 1862 with the formation of a large embankment to impound the river and flood waters to a level of 692·5 feet above datum; the top bank being 698·5 feet. The area of the ground under water is 409 acres; the by-wash or overflow weir, 300 feet long. The quantity of water in the reservoir at this level is 2,374,358,344 gallons; but means have since been adopted to raise the height 12 inches by stop-planks fixed on the top of the weir, which has the effect of increasing the capacity by nearly 109 million gallons. The supply of Vartry water extends and ramifies over a very large area—including the city, townships, and extra-municipal districts—containing an average of about 40 square miles, all of which is supplied with water from the 33-inh pipe under the main embankment at Roundwood; only 3¾ turns of the valve being given out of a total of 40 turns—the full number which it takes to open the valve. The entire cost of the works up to date has been £660,000, which is equal to about £1 17s. per head of the gross population supplied, taking the population of the rural districts at 20,000. The charge for water for domestic purposes to the inhabitants in the city is a rate of 4d. in the pound, and 3d. for the public water-rate; making a total of 7d. in the pound on the Government valuation. Water for trade purposes is charged at 6d. per 1000 gallons; and for small supplies, which it is difficult to measure separately from the domestic, a rate of 20s. per annum is imposed. The total gross rental received by the Corporation from all sources for their water supply for 1889 was £62,343. The cost of maintenance, including salaries of officers, office expenses, labour, and materials, was £60,491; leaving a balance of £1852 on Dec. 31, 1889. Having dealt with the question of paving, Mr. Harty passed on to describe the sewerage system. He stated that there are close upon 100 miles of sewers in Dublin, 76 miles of which have been entirely new built by the present Corporation; the remainder being old ones remodelled, renewed, and underpinned. All the new brick sewers are egg-shaped; and the old ones have been newly inverted. The sewage all gravitates to the Liffey, where it is discharged within the city boundary. The last subject discoursed upon by Mr. Harty was the electric lighting undertaking of the Corporation. On this matter he said: In accordance with powers obtained, the Corporation of Dublin have now in course of construction a central electric lighting station to supply the first area covered by their Licence. The streets through which the mains for public and private lighting will now be carried are: Westmoreland Street, Sackville Street, Mary Street, Grafton Street, College Green, College Street, D'Olier Street, Henry Street, Dame Street, Parliament Street, and Capel Street (part); provision being made for future extension of the area as required. The public lighting will be by means of Brockie-Pell single-carbon arc lamps in series, taking a current of 10 ampères and 50 volts, and arranged to burn 16 hours without renewing. They will be fixed on iron lamp-posts, 21 feet high to the centre of the lamp, of ornamental design, with weather hoods and opalescent globes. In the base of each post will be fitted a special short-circuiting switch, to enable any lamp to be completely isolated from the circuit when necessary; and alternate lamps will be on different circuits, to avoid the total extinction of light in case of temporary interruption to any one line of conductor. The current will be generated by Brush dynamos, and will be kept constant by an automatic regulator. The supply for the private lighting will be on the high-tension alternating-current transformer system; the pressure in the mains being 2000 volts, reduced by transformers in the consumers' houses to 50 or 100 volts as desired. The transformers are guaranteed to reproduce in the secondary circuit 95 per cent. of the energy absorbed in the primary circuit at full load, and not less than 75 per cent. at half load; and they will run continuously without overheating. The generating plant is being erected upon land belonging to the Corporation, situated at the back of the Bank of Ireland; and it will cover an area of about 12,000 square feet, with room for extension. The frontage in Fleet Street is of red brick, with granite string courses, and comprises a three-storey building in which the various offices, stores, switch and test rooms will be placed, and a machinery hall 100 feet long, 50 feet wide, and 40 feet high; the latter being ventilated by swing windows in the sides and skylights in the roof. At the back of these buildings, the boiler-house, coal-stores, and water-tanks are placed; and at one end a brick chimney, 120 feet from the ground level, is being erected. The foundations for the walls of the main buildings are of cement concrete, and are carried 12 feet below the ground level; the foundations for the engines, dynamos, and chimney being carried some 2 feet lower, to the solid rock. The engines selected for driving the private lighting plant are being built by Messrs. Victor Coates and Co., of Belfast, and consist of three pairs of coupled compound non-condensing horizontal engines, guaranteed to realize 280-horse power on the fly-wheel of each pair, with steam pressure of 140 lbs., and running at 85 revolutions per minute; the diameter of the high-pressure piston being 17 inches, the low-pressure one 34 inches, and the length of the stroke 36 inches. The public lighting plant will be driven by three vertical compound engines, each capable of realizing 60 brake horse power at a speed of 220 revolutions per minute with steam at 140 lbs.; the high-pressure cylinder being 9 inches in diameter, the low-pressure one 15 inches in diameter, and the stroke 10 inches. The cylinders will be fitted with automatic and hand expansion gear, adjustible while the engine is running; and the governor will be of a specially sensitive high-speed type. The output of the plant installed is equal to 120 arc lamps of 500 volts each, and 5000 incandescent lamps of 60 volts each, being in use at one time, with one complete spare plant in reserve in each case. The switch-room, situated on the ground floor of the office building, is separated from the engine-room by a glazed partition; and it will contain three complete sets of automatic regulating apparatus to maintain a constant electro-motive force at the terminals of the alternators. This is effected by placing a shunt of varying resistance across the field of the exciter. The test-room, which adjoins the switch-room, is fitted with a very complete set of instruments for testing the condition of the various circuits and machines, and recalibrating the numerous ammeters and voltmeters in use in the station. The adjustment of meters and testing transformers will also be carried out there. The Thompson reflecting galvonometer is mounted on a concrete pillar, carried some 12 feet below the ground line to minimize vibration. The Wheatstone bridge and testing battery will be permanently connected on an isolated testing-table in a convenient form. The boilers will be fed by three Worthington steam-pumps, each one capable of supplying sufficient water to two of the boilers when fully loaded, and arranged so that any boiler can supply any pump with steam entirely independent of the main steam-pipes. The Corporation will bring, free of expense, their surface lines to any consumer's premises situated within 30 feet of their mains; an extra charge being made for any greater distance. In all cases the consumer's installation must be passed by the Corporation Inspector before connection will be completed, and be in accordance with the rules laid down by them to secure efficiency and safety. The charge to the consumer will be either by special contract or by meter, as may be desired. The minimum rate per quarter is £2 for any quantity up to 60 units; over 60 and under 100 units per quarter, 8d. per unit; over 100 units per quarter, 7d. per unit. Hire of meter per quarter, 6s. The meters will, of course, be fixed on the low-tension main—their accuracy being guaranteed by the Board of Trade Inspectors; and the current will be available for 23 hours per diem. The entire cost of the electric lighting works, as at present designed, will be somewhere about £31,000; and they will be maintained by, and kept under the control of, the Corporation.

Mr. R. H. Dorman, County Surveyor for Armagh, followed with a paper on "Road Maintenance," at the close of which a discussion took place on the two communications.

Votes of thanks were then accorded to Messrs. Harty and Dorman; and the proceedings closed.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday.*

After the customary interregnum of the holiday month, the Edinburgh and Leith Gas Commission once more steps upon the scene. A meeting of the body was held on Monday, before which there were one or two items of business that are worthy of notice. Reports were submitted by the Engineers for July and August, which showed that the output of gas from the Edinburgh works during the two months was 83,703,000 cubic feet, as compared with 84,899,000 cubic feet in the corresponding period of last year—a decrease of 1,196,000 cubic feet; and from the Leith works the output was 29,212,000, as compared with 28,969,000 cubic feet—an increase of 243,000 cubic feet. From both works there was thus a decreased output of 953,000 cubic feet. Elaborate tables were given showing a variety of results; but it may be sufficient to state that in July Mr. Mitchell, in Edinburgh, obtained 9838 cubic feet of 24·81-candle gas per ton of coal of an average price of 17s. 3·9d. per ton, against 13s. 0·8d., and a yield of 9779 cubic feet last year; and that Mr. Linton, in Leith, obtained 10,378 cubic feet of 27·41-candle gas per ton of coal costing on an average 17s. 11¾d. per ton, the price last year being 11s. 7¾d., and the yield, 9587 cubic feet. For August the figures were: Edinburgh—yield, 9906 cubic feet; price, 18s. 1·4d.; illuminating power, 25·90 candles; last year's price, 14s. 4·5d., and yield, 9854 cubic feet. Leith—yield, 10,408 cubic feet; price, 18s. 10¾d.; illuminating power, 26·78 candles; last year's price, 12s. 8¼d., and yield, 10,255 cubic feet. A motion was submitted by Mr. Pollard and Bailie Turnbull proposing a remit to the Works Committee to inquire with regard to the present cost of coal in the large towns of Scotland and the North of England, the quality and price of gas in those towns, and the causes of difference in comparison with the price of gas in Edinburgh and Leith. Mr. Wells remarked that they had a report of the same kind about a year ago; and it had not done any good. The remit was, however, agreed to. Subsequently Mr. Gibb, the Treasurer, submitted a letter which he had received, containing an offer to lend the Commission £3000 for seven years at 3½ per cent. In discussing whether the offer should be accepted, Bailie Archibald said he was unaware till recently that £21,000 of their revenue last year was locked up in capital in connection with the new retorts, which hampered them. Mr. Wells suggested that they should start small experimental works, say at Slateford, which would supply the village with gas; and they could there test all the coal which they purchased, and see what difference there was between the quantity of gas which was guaranteed by the coal-owner to be in the coal, and that which they obtained. He observed that in the Edinburgh works they should have had an average of 11,000 cubic feet per ton of coal, instead of 9750 cubic feet. This brought up Mr. Mitchell, who explained that he had had an experimental station in the Edinburgh works for the past 15 years; and that from next week till the beginning of May all the coal which came in would be tested, and the result tabulated by one of the most experienced assistants they could possibly get. Mr. Wells remarked that the Commissioners must have been misled by the coalmasters, who, in some cases, had guaranteed as much as 13,000 cubic feet of gas per ton in their coal. The Chairman reminded the members that the question before them was that of borrowing the £3000; and on the motion of Bailie Archibald, it was remitted to the Law and Finance Committee to consider as to whether it was expedient to cover the capital expenditure already made.

When last week I wrote, regarding the incident between Mr. Alex. Smith, of Aberdeen, and Mr. Councillor Pratt, that the last had probably been heard of it, I was wrong, for it is this week as prominent as ever. It was the intention of Lord Provost Stewart that the proceedings of the Committee upon which he was to act, were to be private, and the result of their deliberations only was to be announced. In this he was disappointed, a newspaper paragraph having appeared on Monday giving an account of what the Committee had been doing in the way of reconciliation. The Committee, forthwith, resolved to terminate their labours and to publish an account of their proceedings, which appeared on Wednesday. The incident itself is a miserable one; but the status of gas managers is involved in it, and therefore I feel called upon to deal rather fully with it. The origin of the incident was a paragraph which appeared in one of the Aberdeen newspapers, in which it was hinted that machinery of the value of about £1000 had been delivered at the gas-works without the knowledge of the Gas Committee or Convener. This was so serious an announcement, that a meeting of the Gas Committee was called for next day to consider it. At that meeting, Mr. Smith explained that the machinery which had been received did not amount to £50 in value, and consisted of one or two wheels for the stoking machinery, which the contractor (Mr. West) had agreed to substitute for portions which were found to be unsuitable. This work would have been carried out long before by Mr. West; but at Mr. Smith's request it was delayed till the dull season. The stoking machinery, it was explained, had never been taken off Mr. West's hands; and the alterations were being made at his expense. At the meeting of the Gas Committee referred to above, all the members were asked individually if they were the authors of the disturbing paragraph; and all of them repudiated it except Mr. Pratt, who objected to the question being put to him. He went the length, however, of seconding a vote of censure upon the person who was responsible for the paragraph. After the meeting, Mr. Pratt and several other members visited the gas-works and examined the new machinery; and it was while there the words Mr. Pratt complains of were alleged to be addressed to him by Mr. Smith. He brought the subject up at the next meeting of the Gas Committee; but it was ruled out of order, the Town Clerk holding that the affair was one between Mr. Smith and Mr. Pratt, and did not concern the Committee at all. Thereafter Mr. Pratt raised the question in the Town Council, with the result that a Sub-Committee of three was appointed to meet Mr. Smith and Mr. Pratt and try to heal the matter up. I send you the official account of their proceedings [given elsewhere], showing that the Sub-Committee have been obliged to throw Mr. Pratt up in disgust. Of his conduct, it is impossible to speak too deprecatingly. The paragraph was a gratuitous attack upon the management of the gas-works; and if Mr. Pratt is not willing to state whether or not he played any part in its publication, he deserves, rather than an apology, to be forced to retire from public life. If Mr. Pratt were not the instigator of the paragraph which has worked all the mischief, he has only to say so to clear himself of all blame in the matter; if he were the instigator, and declines to give or accept an apology, the only remedy is to set him aside. If the electors will not do so, then let his coadjutors in the Town Council taboo him.

The Dundee Gas Commission met on Monday and appointed Messrs. Urquhart and Small, consulting engineers, of Westminster, in connection with the proposed electric lighting installation in the city of Dundee. It was stated that Mr. Small is the son of a late Dundee Solicitor; and that seemed to be the chief recommendation which the firm had to the appointment. It was stated that, although the firm had given the name of Mr. Preece as a reference, that gentleman had not been consulted about them. In making the appointment, the Commissioners reserve to themselves the power to have the plans and specifications of Messrs. Urquhart and Small submitted to, and revised by, an engineer of eminence. This is surely not the most satisfactory way of going to work. The firm may be the best electricians in the country; but a little inquiry into their capabilities would not have been out of place.

From our Glasgow Correspondent.

GLASGOW, *Saturday.*

Subject to a confirmation at the next meeting of the Glasgow Corporation Gas Commissioners, a recommendation has been made by the Gas Committee that Mr. Robert M'Alpine, of Glasgow, be entrusted with the contract for the excavation, brick, and masonry work of the big tank for the new gasholder which it is proposed to erect at the Temple Gas-Works which were lately acquired by the Corporation from the Partick, Hillhead, and Maryhill Gas Company, and are close by the Dawsholm works of the Glasgow Gas Commissioners. I am told that Mr. M'Alpine's offer, which was the lowest, is very close upon £19,000. When completed, the tank is to be 240 feet in diameter between the guide faces, and 45 feet deep from the top of the cope, the stones of which are to be 3 ft. 9 in. broad, not less than 3 feet long, and 1 foot thick. The foundation of the wall is to be 15 ft. 6 in. broad, and 14 inches thick; and for a height of 15 ft. 10 in. it is to be 7 ft. 6 in. in thickness, the other thicknesses being 6 ft. 8 in., 5 ft. 6 in., 4 ft. 8 in., and 3 ft. 6 in. There are to be twenty-six piers at equal distances around the tank; and on these the standards for the holder are to be erected in due course. From the date of the actual acceptance of the contract, a period of twelve months is to be allowed for the completion of the work. If, however, it is finished in all respects in a satisfactory way one month before the contract period has expired, the contractor is to be allowed an additional sum of £500. The holder which is to be used in this tank is to be of the three-lift type, with a capacity of nearly 6 million cubic feet.

On Tuesday of this week, the Contracts Committee of the Glasgow Gas Trust had under consideration the tenders which had been received for the coal required to complete the supply for the current year. Since the meeting of the Committee was held, I have learned a few facts of interest regarding the contracts that were then settled. I am told that tenders were accepted for well-nigh 150,000 tons of splint and cannel coals; and that the prices, so far as the cannels are concerned, range from 1s. to 1s. 6d. per ton under those at which the same or similar coals were offered at the last purchasing time. That fact only has reference to coals of such quality as will yield gas of not less than 22 standard candles, as really rich cannels are not wanted by the Glasgow Gas Trust. My informants tell me that in three instances quantities of 30,000 tons are included in the purchases; and some satisfaction has been expressed at the fact that on this occasion the offer of the Lanemark Coal Company has been included amongst those three somewhat large acceptances. The Lanemark coal is, I rather think, the richest that has been purchased in large quantity at this time. A similar quantity of Bankend cannel has been purchased; and a lot of 30,000 tons of the Nitshill and Lesmahagow Company's Craignathan cannel has also been accepted. These two cannels are, I am informed, practically alike in respect of the quality and quantity of the gas which they will yield. Several varieties of what may be called third-class cannel coal have been secured at prices ranging from 10s. 6d. up to 11s. 8d. per ton. The splint coals that have been included in the purchases are to be obtained chiefly from the Hamilton district; and the prices generally range between 8s. 6d. and 9s. 6d. per ton. On the whole, the Contracts Committee believe that they have been decidedly successful in this second series of coal purchases; and they consider that they were quite justified in not completing the whole of their contracts for the year when they made their purchases several months ago.

It is announced to-day that the appeal by the Stirling Gas Company to the Court of Session against the decision of the Burgh Valuation Appeal Court last week is to be dropped; and it is stated that the Assessor has likewise notified his intention not to proceed with his appeal against the same decision. I may also here refer to the appeal made by the Troon Gas Company against the valuation of £178 put upon their works, which they proposed should be reduced to £80. The question raised, which came before the Valuation Committee of the Ayrshire County Council, was as to the deduction of 20 per cent. off the net profits. It was maintained that much larger deductions should be allowed. After some conversation, in which several members of the Committee gave their opinion that something should be allowed for depreciation, it was agreed to allow a deduction of 40 per cent. on the net profits, bringing down the valuation to £134. Mention should likewise be made of the fact that, on appeal being made to the Burgh Valuation Appeal Court, the Port-Glasgow Gas-Works valuation by the Assessors was reduced from £1286 to £1040.

The Glasgow pig-iron warrant market has been quiet during the past week. Scotch warrants have remained steady at about 47s. 2d. per ton, at which there were sellers at the close of the market yesterday afternoon. Hematite iron has fluctuated in price between 50s. 6d. and 50s. 2½d. per ton—the latter being the closing price yesterday; and Cleveland warrants have ranged between 40s. 9d. and 40s. 5½d. per ton,

the closing price yesterday for buyers being 40s. 5d. per ton cash. The market has been quite without feature all the week, with no great bulk of business passing. There are 75 blast furnaces in actual operation, as compared with only 9 at this time last year.

There has been an all-round good tone in the Glasgow coal trade this week; and main sorts have been advanced slightly. The shipping demand continues fairly brisk, although the amount despatched was under that of last week. The lessened shipments, however, have been wholly due to the boisterous weather delaying ships. Main has been sold at 8s. to 8s. 2d. per ton. House coal in Lanarkshire and Fifeshire has been advanced 1s. and 6d. respectively. Sellers are well off for orders; hence prices all round have rather tended to harden than otherwise. The home consumption is increasing, and is likely to still further expand, as in the iron and steel industries a distinct improvement is noted. A favourable factor is the easier market for dross. Yesterday's quotations were: House coal, 10s. per ton at the pits; main, 8s. to 8s. 2d. per ton f.o.b.; splint, 9s. to 9s. 3d.; steam 9s. to 9s. 3d.; dross, 3s. to 3s. 6d.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 3.

Sulphate of Ammonia.—There is very little change in the market, although a further reduction in values is still attempted. The weakness seems, however, to be more apparent than real; and when it is considered that the total decline does not, after all, exceed 5s. per ton, there is still something to be thankful for. At the close, some more inquiry is springing up; and the opinion is gaining ground that the lowest point has been touched. Business is reported at £10 10s. at the various ports. Nitrate is steady, at 9s. for spot; cargoes for spring arrival being 9s. 6d. to 9s. 7½d.

LONDON, *Oct.* 3.

Tar Products.—The chief feature of this market is the remarkable demand for pitch. It is curious that dealers will pay higher prices than can be obtained from actual consumers; and it looks very much as if this article is going to be added to the long list of chemical products operated upon by speculative dealers. The demand for anthracene is slack, and the prices named below are not readily obtainable. The same remark applies to benzols; but there is undoubtedly an effort on the part of buyers to unduly depress this article. Stocks are bare; and an important increase in the consumption of aniline should prevent the price becoming any lower. Creosote oils are in moderate request; while carbolic acid is dull. Solvent naphtha is looking up; and higher rates are expected for it. The following prices have been noted during the week: Tar, 23s. 6d. to 26s. Pitch, 33s. 6d. to 35s. 3d. Benzol 90's, 3s. 9d.; 50's, 2s. 8d. Toluol, 1s. 5d. Solvent naphtha, 1s. 5d. Crude naphtha, 1s. 2½d. Creosote, 1⅝d. Carbolic crystals, 6d.; crude, 60's, 1s. 3d. Cresol, 8d. Anthracene, "A" quality, 1s. 2½d.; "B" quality, 1od.

Sulphate of Ammonia.—Extreme dulness rules in this market. Buyers are purchasing from hand to mouth, with the expectation of a lower price. The production is now enlarging, and there are some stocks ,but with the increased price of nitrate, if makers were only firm, the machinations of dealers to depress this market would be defeated. The actual requirements of sulphate for the ensuing season are now known to be very large, and probably in excess of the production; and it only remains to be seen whether the middleman or the manufacturer shall regulate the price. Various prices have been named; and quotations have been as low as £10 7s. 6d. But £10 10s., less 3½ per cent. discount, is perhaps the average spot price; while 5s. to 10s. more is obtainable for forwards. Gas liquor is selling at from 4s. 6d. to 5s. 6d.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

As I have anticipated in previous reports, the present month has opened with a pretty general upward movement in all the better qualities of round coal suitable for house-fire consumption. The demand for these was exceptionally brisk during the past month; and in many cases colliery proprietors have already been compelled to fill up out of stocks to meet the requirements of their customers. So far as any further accumulation of supplies for winter requirements is concerned, this is now altogether at an end; and, with very few exceptions, colliery owners enter upon the winter with much smaller stocks than they have held at a similar period for a very considerable time past. The upward movement this month is practically a return to the full rates ruling last winter, and does not affect those collieries where no reductions on list rates have been made during the summer months. In the Manchester district, the advance in prices is consequently only of a partial character, and in no case applies to the land sales at the local collieries. One of the leading firms, however, have raised their station prices generally from 5d. up to 10d. per ton; and in other cases there have been similar movements in several of the outside districts. These advances mainly represent a withdrawal of concessions made during the summer. In the South-West Lancashire districts, the rise of 6d. to 1s. per ton upon house-fire coals has been almost general; and prices quoted at the pit's mouth are now about as under: Best Wigan Arley, 12s. 6d. to 13s. per ton; Pemberton four-feet coals and second qualities of Arley, 10s. 6d. to 11s., with some special qualities quoted at 12s.; and common house-fire coals, 9s. to 9s. 6d. Outside the last-named class, there is no really material change to report in the general position of the market, except so far as the pressure for the better qualities for house consumption is concerned; and the advance in the price of these is likely to throw an extra demand upon the lower qualities of round coal. For iron-making, steam, and general manufacturing purposes, the demand continues only moderate. But prices have, if anything, hardened slightly; and 8s. to 8s. 6d. would represent the average quotations at the pit's mouth. Engine classes of fuel continue quite as difficult to dispose of as ever. With no improvement in the demand, supplies of some descriptions have been rather more plentiful; and in inferior descriptions of slack, rates are being pushed at excessively low figures. At the pit's mouth, burgy does not average more than 6s. 6d. to 7s. per ton; and the best qualities of slack, 5s. 6d. to 6s.—inferior descriptions being obtainable at as low as 2s. 6d. and 3s. per ton and upwards. A fairly active demand for shipment is reported generally; and ordinary descriptions of steam coal are readily fetching 9s. 6d. to 10s. per ton delivered at ports on the Mersey. Coke continues only in moderate request; and the best Lancashire foundry kinds do not average more than about 15s. per ton at the ovens.

Northern Coal Trade.—There has been a continuance of the quieter tone in the steam coal trade during the past few days; and, in one or two instances, slight further concessions have had to be made by coal-owners to obtain prompt sales, to keep pits fully at work. Still, on the whole, the price for best steam coal may be given at about 12s. per ton, free on board. Small steam coal is flat, at about 4s. per ton. For gas coal the demand is now satisfactorily increasing, and seems likely to be higher this winter than has ever yet been known; for the consumption of the great gas companies appears to be still increasing. The price of best gas coal is 9s. 6d. per ton, free on board, though there are one or two producers of best Durham who ask up to 10s. per ton. Orders for the great northern companies are now being enlarged; and the deliveries on old contracts are at very satisfactory prices. Bunker coals for steamships are quiet, with a price of from 8s. 6d. to 10s. per ton for unscreened, and up to 12s. for best Durham screened. Manufacturing coal is more in request, and contracts are being negotiated for next year's supplies for the factories, but at a reduction of prices of from 6d. to 1s. per ton on those which have ruled for the present year. There is a fair demand for blast-furnace coke; the iron trade being a little firmer. Gas coke is unaltered; but concessions need to be made to secure contracts for next year. The price of other coke is less.

The South Metropolitan Gas Company's Kennington Oval Holder At the meeting of the Lambeth Vestry last Thursday, the Law and Parliamentary Committee reported that, having considered the letter of Mr. Taylor, on the subject of the increased size of the gasholder in course of erection near the Vestry Hall (see *ante*, p. 546), they had resolved that the Clerk be directed to write to the County Council calling attention to the danger to the public from the increased size of the holder, and asking them to take any proceedings within their power to stop the erection. This was agreed to.

The Extension of the Tipton Gas-Works.—An interesting ceremony was performed last Wednesday at the Tipton Gas-Works, by the Chairman of the Gas Committee (Mr. D. Hipkins), in turning on the gas into the holder which has been recently erected. In the course of a few remarks, the Chairman said the rapid increase in the consumption of gas in the district indicated the growing prosperity of the parish, and rendered an extension of the works absolutely necessary. The new holder had a storeage capacity equal to 480,000 cubic feet; being almost double that of the two old ones. It had been erected from designs prepared by the Engineer and Manager (Mr. Vincent Hughes), who also superintended the construction. The tank was built by Messrs. Herbert Hughes and Son, of Lower Gornal; and the holder by the Horseley Company. The valve was then opened by the Chairman; and the company afterwards retired to the Manager's office, where refreshments were provided, and the Chairman's health was heartily pledged.

Action in Regard to a Gas-Making Patent.—In the City of London Court, on Monday last week, before Mr. E. B. Tattershall (Deputy-Registrar), an action was brought by Messrs. Martin and Willis, trading as the International Patentees' Agency, 55 and 56, Chancery Lane, E.C., who sought to recover the sum of £30, money advanced to the defendant, Mr. Conrad Herzog, of 37, Walbrook, E.C. Mr. Boxall appeared for the plaintiffs; Mr. Raw for the defendant. The plaintiffs' case was that the defendant brought them a patent for making gas, and wished them to get up a Syndicate who would purchase it, or float a company for the purpose. It was necessary to demonstrate the advantages of the patent; and the plaintiffs lent £30 to put up certain machinery, which they now wanted returned. The defence was that the plaintiffs had broken their contract, under which they were to spend £100 in demonstrating the patent, and that they were to deduct the £30 out of the sale of the patent. This was denied by plaintiffs. The Court found for the plaintiffs, with costs.

Water Companies and the Recovery of Rates on Mortgaged Property.—In the City of London Court last Saturday, before Mr. Commissioner Kerr, the case of the East London Water-Works Company *v.* Chard was heard, in which the plaintiff Company sought to have the defendant, Mr. C. H. Chard, of No. 3, Rathgar Road, Loughborough Junction, committed to Holloway Gaol for the non-payment of £7 19s. 6d., due for water supplied to houses in Bow, of which he is the owner. Mr. George Kebbell, the Company's solicitor, said the position they were in was anomalous. The defendant had collected the water-rate from the houses to which they had supplied the water in question, and did not pay it over. They were prohibited, under Mr. Forrest Fulton's Act, from cutting off the supply where the annual value was less than £20; so that they had absolutely no remedy. Mr. Commissioner Kerr said this was a monstrous state of affairs. It was practically making a present of the water to the property-owner. The defendant said he received the rents, but he paid over the whole amount (£6 per month) to the mortgagees of the property. He actually paid £1 per month more than he received himself. Mr. Kebbell asked if the Company were to go on supplying these houses with water for nothing for ever; for this was what it amounted to. Mr. Commissioner Kerr told the defendant he must discharge his debts due to the Company before he paid the mortgagees of the houses. Mortgagees had no right to get all the money, and leave water companies to supply the tenants for nothing. The defendant said the mortgagees did not care so long as they obtained the money. Mr. Kebbell said water companies would come to an end very soon if this sort of thing went on long. The Company had £50,000 outstanding in this way. Mr. Commissioner Kerr ordered the defendant's committal for twenty days, but with a suspension for a month to enable him to pay the money.

The Bottesford Gas Company, Limited, is the title of a Company which has lately been registered, with a capital of £1500, in £5 shares, to acquire the gas-works at Bottesford, in Leicestershire, and carry on and extend them.

Coal in New Zealand.—Another coal discovery is reported from New Zealand; this time at Rangiriri, where the strata and seams present the same character as those at Huntly, already known as the centre of a valuable coal bed. The first seam reached in the borings was 6 feet thick; and, still lower, separated by hard sandstone and clay, a second seam, 12 feet thick, was struck. This rests on fire-clay—generally a good indication of a third seam below.

The Gas Supply of the Salford Out-Townships.—The Barton Rural Sanitary Authority last Wednesday received a deputation from the Swinton and Pendlebury Local Board with respect to the gas supply of Clifton; and after hearing them, they decided to raise no objection to their proposal to apply for powers to supply that township with gas, but reserved to themselves the right to oppose the clauses of the Bill, if they were not satisfactory to gas consumers of the district.

Gas Exhibition and Cookery Lectures in Dublin.—The Alliance and Dublin Consumers' Gas Company are making great efforts to increase their day consumption; and, with this end in view, an exhibition has been arranged for the present and next week, by Messrs. Richmond and Co., of Warrington, of their various gas appliances and cooking ranges. A special feature of the lecture-room is a temporary amphitheatre platform, ranged right round the table upon which Mrs. Thwaites prepares her various dishes; enabling everyone to see perfectly how the stoves do their work. Mr. E. W. T. Richmond opened the exhibition, in the presence of a large and fashionable audience; and gave an address on "Gas Cooking."

Middlesbrough and Electric Lighting.—At a meeting of the Middlesbrough General Purposes Committee last Wednesday, a deputation was received from the Middlesbrough Electric Lighting Company, to give information with regard to the proposal to supply the borough with the electric light. Mr. Sellon, the Assistant Manager of the Company, explained the leading features of the Provisional Order for which they were applying. He admitted that the price the Company would probably charge for the use of the electric light would be 60 per cent. more than the cost of gas; and he stated that the Company were backed up by the Brush Electric Lighting Company, and this would be a guarantee of the success of the undertaking. It was subsequently decided that the matter should be referred to a Sub-Committee.

Water Supplies from the River Severn.—At the meeting of the Severn Fishery Board of Conservators last Thursday, at Birmingham, the Chairman (Mr. J. W. Willis Bund) proposed that the Committee be authorized to take such steps as might be necessary to bring before the Government the desirableness of not giving powers to local bodies to take water from the Severn watershed until all the schemes relating thereto were before them, so that they might be considered as a whole by Parliament. There were various schemes now being mooted—there was one from Birmingham, by which it was proposed to abstract water from the Wye, and possibly from the Severn; and there was another great scheme being promoted by the London County Council which might also affect their watershed. There were, in fact, many schemes having for their object to take pure water from the Severn district; and they ought to be careful that nothing was taken which they could not spare. The Vice-Chairman seconded the motion. Mr. Airey said he had some doubt as to the wisdom of passing such a resolution. He thought that large communities like London, Liverpool, Manchester, and Birmingham, should receive every help in their endeavours to obtain a plentiful supply of pure water. He doubted whether they had a moral right to say they should not take it. A member asked whether, if the resolution was passed, they would have to oppose all the schemes? The Chairman replied in the negative. What they wanted was, he said, to prevent those public bodies taking the water if there was no surplus. It was all very well to talk about the teeming millions of London and Manchester; but their first duty was to themselves. If there was a surplus, the authorities could have the water on certain terms. The resolution was carried.

West Gloucestershire Water Company.—The half-yearly meeting of this Company was held last Saturday week. The report submitted by the Directors stated that during the six months ending Sept. 5 last, 523 additional services had been laid on; making the number of houses supplied by the Company on that date 2917, and which, including some meter supplies, were estimated to produce a water-rental of £2480 per annum. To this must be added about £50 per annum for rent of property belonging to the Company; thus making the total estimated income on that date £2530 per annum. This was an increase of £413 during the past six months; but the income for the current half year had only been benefited to a comparatively small extent by this increase, as it had principally taken place towards the close of the half year and since the accounts were made up. The Directors were satisfied that the undertaking was daily growing in strength; and they trusted that before long they would be able to recommend the payment of dividends. The Chairman (Mr. E. Horton), in moving the adoption of the report and accounts, said that from them it would be evident to the shareholders that the undertaking was daily becoming more valuable. Although in the early part of the year the Company's progress was blocked by the severe and continued frost, yet the estimated increase of revenue for the year amounted to £413. The Directors, having in view the great importance of making all the extensions possible, had expended nearly £4500 during the half year; but as those extensions had only just been completed, no benefit of revenue was realized in the present statement of accounts. The report was adopted. An extraordinary meeting was then held, for the purpose of passing a resolution authorizing the creation and issue of debenture stock, under the provisions of the Company's Act of 1884. The Secretary (Mr. James) explained that the Company were now paying 5 per cent. on the purchase-money of the land and springs at Frampton, or £325 a year; and it was proposed to raise the money by the issue of £6500 of 4 per cent. debenture stock, of which more than one-fourth had already been promised. A resolution for authorizing the issue of the stock was adopted.

Lighthouse Illuminants.—Mr. John R. Wigham, of Dublin, has lately issued a pamphlet on the subject of lighthouse illuminants; being his evidence before the Committee of the Royal Society appointed by the Board of Trade to inquire into the Trinity House report of their experiments at the South Foreland. Mr. Wigham points out the disadvantages of the electric light for lighthouse purposes; showing that in clear weather it is dazzling and misleading to the mariner, and that in foggy weather it is comparatively useless. This evidence is strikingly corroborated by the recent manifesto of the London Shipmasters' Society, who state that, in certain conditions of the atmosphere, the electric light is invisible, while oil lights of lightships and gas lights of seaside towns are comparatively bright and distinct; and still more recently confirmed by the French lighthouse authorities respecting the lighthouses of Cape la Hève. There for a time an oil light was substituted for one of the electric lights, when it was found that in very thick weather, though it was impossible to make out the electric light, the oil light was sufficiently visible.

Water Companies and their Rights.—At the Brentwood Police Court last Thursday week, the South Essex Water Company were summoned by Mr. John Haltridge, a house agent, for neglecting to supply water to a certain house. The water had been laid on to the house for some years; but the place becoming untenanted, the Company, without notice to the owner or agent, cut the communication. When the house was let again, application was made to the Company to restore the communication; but this was not done. The contention for the owner was that as he had been at the expense of connecting his property with the main, and the Company, without notice to him, severed it, they were bound to restore it. For the Company it was argued that they had not neglected to supply, because there was water in the main of which the plaintiff could make use if he connected with it; and, further, it was urged that the Company were entitled to disconnect if the rate was not paid. In this case the rate was not paid; and it was not for the Company to go round and find out what houses were unoccupied. The Magistrates deferred their decision; it being intimated that the Company would ask for a case if judgment was against them.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 614.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16—17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11—12	..	6 3 0
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	105—107	..	4 13 5
100,000	20	28 May	8	Bahia, Limited	20	13—15	..	10 13 4
200,000	5	13 May	7½	Bombay, Limited	5	6¾—7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	4¾—5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	218—223	..	5 9 10
125,000	,,	,,	9½	Do. New	100	157—162	..	5 14 2
220,000	20	16 Sept.	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	10 Apl.	11½	British.	20	45—47	..	4 15 9
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18—20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13—15	..	5 13 4
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7—8	..	— —
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	90—95	..	6 6 4
150,000	20	13 Aug.	8	Cagliari, Limited	20	24—26	..	6 3 1
550,000	Stck.	10 Apl.	13¾	Commercial, Old Stock	100	255—265	..	5 3 9
130,000	,,	,,	10¾	Do. New do.	100	190—200	..	5 7 6
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—124	..	3 12 7
800,000	Stck.	11 June	10	Continental Union, Limited	100	230—240	..	4 3 4
200,000	,,	,,	7	Do. 7 p. c. Pref.	100	190—200	..	3 10 0
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	197—202	..	4 19 0
486,090	10	15 July	10	European, Limited	10	20—21	..	4 15 3
354,066	10	,,	10	Do. Partly paid	7½	14½—15½	..	4 16 9
5,470,640	Stck.	13 Aug.	13	Gaslight & Coke, A, Ordinary	100	228—233	..	5 11 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	94—97	..	4 2 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	254—259	..	3 17 3
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118—123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172—177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160—163	..	4 5 10
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	251—256	..	3 18 1
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	153—158	..	3 16 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112—115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120—125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163—168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	227—232	–1	5 3 5
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4¼—4¾	..	6 6 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	109-111*	+½	4 10 1
541,920	20	11 June	6½	Monte Video, Limited.	20	16½—17½	..	7 8 6
150,000	5	28 May	10	Oriental, Limited	5	8¼—8¾	..	5 14 3
60,000	5	30 Sept.	7	Ottoman, Limited	5	4—5*	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited.	10	2¾—3¼	..	— —
420,000	100	4 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl.	10	San Paulo, Limited	10	13¾—14¼	..	6 18 0
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	274—279	–4	5 11 1
1,550,000	,,	,,	12	Do. B do.	100	225—230	–3	5 4 4
200,000	,,	,,	13	Do. C do.	100	235—240	..	5 8 4
700,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	141—145	..	3 9 0
60,000	5	16 Sept.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	265—270	..	3 14 1
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	212—216*	+½	3 14 3
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138—143	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	109—113	–½	3 11 9
708,000	Stck.	13 Aug	10½	Kent	100	270—280	..	3 15 0
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	237—242	..	3 18 6
406,200	100	,,	7½	Do. 7½ p. c. max.	100	193—198	..	3 15 9
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—121*	+1	3 6 1
500,000	100	13 Aug.	12½	New River, New Shares	100	341—346	..	3 10 1
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	123—126	..	3 3 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	165—170	..	3 16 5
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160—165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex.	100	255—260	..	3 16 7

*Ex div.

The Inclined Retort Stoking Machinery at Middlesbrough.—The order for the elevators to feed the inclined retorts at the Middlesbrough Gas-Works has been placed with the New Conveyor Company, Limited.

The Dangers of Paraffin Lamps.—Last Friday afternoon, Mr. G. P. Wyatt, Deputy Coroner for East Surrey, held an inquiry at St. Thomas's Hospital with reference to the death of Alison Talbert, aged ten years, of 16, Philadelphia Terrace, Westminster Bridge Road. The mother said that about half-past eight o'clock last Wednesday night deceased went upstairs with a pail in one hand and a lighted paraffin lamp in the other. A few minutes afterwards, witness heard screams of "Mother, mother;" and on going to ascertain the cause, she found deceased standing on the landing enveloped in flames. Thomas Burles, deceased's uncle, said he attempted to extinguish the flames with his coat and a doormat; but he was unsuccessful, as her clothing was saturated with paraffin oil. At this moment someone pulled the child into the street; and in consequence of the flames being fanned by the wind, her clothing burned like a "furnace," and no one was able to go near her for a time. The fire was eventually extinguished, and the girl was placed in a cab and taken to the hospital, where she died next morning. The lamp was an ordinary one, with a glass well, and the oil, which cost 2d. per quart, was bought at an oil-shop in the neighbourhood. In the opinion of witness, the lamp exploded in deceased's hands; possibly owing to the draught from the landing window, which was open at the time. The jury returned a verdict of "Accidental death," and commended Burles for his bravery in attempting to extinguish the flames.

Tavistock Gas Company.—The annual meeting of this Company was held yesterday week. The Directors' report showed that the gross rental from private comsumption for the year was £2250—an increase on the previous year of £376; and, allowing discount for prompt payment, the net rental was £2010. Having purchased the required quantity of coal for the current year on favourable terms, the Directors deemed it prudent to give their consumers the benefit of this, and had accordingly reduced the price of gas to 3s. 6d. net per 1000 cubic feet. A sum of £560, equal to 14s. per share, had been paid to the shareholders during the year; and the Directors recommended a further dividend of 8s. per share for the current year. The report and accounts were adopted.

The Spalding Water Company and the South Lincolnshire Fen Water Company.—At the annual meeting of the Spalding Water Company last Wednesday, it transpired that the contract for the sale of the undertaking to the South Lincolnshire Fen Water Company had not yet been completed. The scheme of the latter was to supply a large district of South Lincolnshire with water, and to absorb the Spalding Company. The contract was agreed upon about a year ago, and £1000 deposit was paid, which sum, it was stated, would be forfeited if the contract were not carried out by the Fen Water Company. In January next the Spalding Company, on a month's notice, have the power to cancel the existing contract for sale, in which case the deposit will be at once forfeited to them. It was mentioned, however, that negotiations were still pending, and that there was a probability of the contract being completed. A dividend of 7 per cent. has been paid for the past year.

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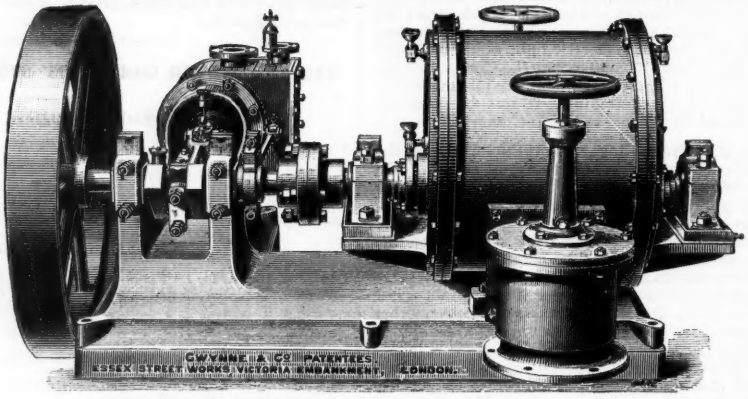

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TAR and Liquor wanted.
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The Subscription List will be closed on or before the 17th day of October, 1891.

The Woking District Gas Company, Limited.

Incorporated under the Companies' Acts, 1862-90, and empowered by an Order made by the Board of Trade and duly confirmed by Act of Parliament.

AUTHORIZED SHARE CAPITAL - - - £16,000,

IN 3200 SHARES OF £5 EACH,

With borrowing powers to the extent of one-fourth of the subscribed capital.

THE SHARES WILL BE PAYABLE AS FOLLOWS:—

On Application, £1 per Share; on Allotment, £2 per Share.

And the Balance as may be required, in instalments of £1 each, but not less than three months after allotment, nor less than one month between the calls, of which 14 days' previous notice will be given.

Where no allotment is made, the deposit will be returned in full; and where partial allotment only is made, the surplus will be applied towards the amount payable on allotment.

Dividends will be payable half yearly.

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CHARLES HOSKINS MASTER, Esq., Barrow Green, Oxted, Surrey, Chairman of Friary, Holroyd, and Healy's Brewery Company, Limited, and Director of the Oxted Gas Company, Surrey.

GEORGE BAKER SMALLPEICE, Esq., F.S.I., Surveyor, Woking.

HENRY WARD ANDREWS, Esq., C.E., 15, Albion Road, South Hampstead, N.W., Director of the Bahia Gas Company, and Consulting Engineer to the Ottoman Gas Company.

SAMUEL SPENCER, Esq., Assoc. M. Inst. C. E. (Messrs. J. E. & S. Spencer), 14, Great St. Thomas Apostle, Director of the Carshalton Gas Company.

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Registered Offices.

5 & 6, GREAT WINCHESTER STREET, LONDON, E.C.

Local Office.

RAILWAY APPROACH, WOKING.

PROSPECTUS.

THIS Company has been formed for the purpose of manufacturing and supplying Gas to the inhabitants of Woking, Horsell, Send and Ripley, Pyrford, and Byfleet, all in the county of Surrey; and is empowered by an Order of the Board of Trade, intituled the "Woking District Gas Order, 1891," and which Order has been duly confirmed by Act of Parliament. The maximum dividend authorized by this Order is 10 per cent. per annum.

Woking is situate on the main line of the London and South-Western Railway, about 24 miles from London. The locality forms part of the noted "Pine District" of Surrey, and is well known for its highly salubrious character, and consequently is rapidly rising in public favour as a residential district. A large quantity of land has lately been, and is now being placed upon the market for building purposes; and a number of large high-class private houses have already been built and occupied, and more are in course of erection. There is a good service of fast trains between London and Woking.

There is an abundant supply of good drinking water obtainable from the Water Company's mains. The development of building estates and the erection of good houses may therefore be confidently expected to continue, and at a more rapid rate than in the past.

Many of the residents and tradesmen have already expressed their desire for a supply of Gas. The Woking Barracks and Brookwood Asylum are within the district of the Company; and negotiations will be opened up with the authorities, with the view of inducing them to take their supply from the Company.

It is anticipated that there will be a very ready sale for Coke and other Residuals, and also a demand for Gas Cooking and Heating Stoves and Gas-Engines.

The works will be commenced at once; and it is anticipated the Company will be prepared to supply Gas at an early date.

A plot of freehold land, about one-and-a-half acres in extent, and well adapted for the purpose, has been purchased for the erection of the works.

It is freely admitted that few investments of capital produce more certain and better results than Gas Companies. The Directors are informed that the following are the dividends paid by some neighbouring and other Gas Companies for last year on their original stock:—

	Per Cent.		Per Cent.
Guildford	10	Staines	11½
Kingston	10	Carshalton	8
Walton-on-Thames	6	Richmond	10
Hampton Court	10	Windsor	10
Aldershot	10	Chertsey	10

The site of the works and roads in the district have been surveyed, and the plans and specification of the works and necessary street mains have been prepared by the Company's Engineer. The latest and most improved appliances for the supply and manufacture of Gas will be adopted. The Company has entered into a Contract with Messrs. Alfred Williams and Company, Engineers and Contractors, of Nos. 70 to 73, Bankside, Southwark, for the erection of the works and plant, and for laying the necessary mains. The work will be carried out in accordance with the plans and specifications, and under the superintendence of the Company's Engineer.

The following Contracts have been entered into, viz.:—

(*a*) **An Agreement dated the 21st day of January, 1891, and made between Alfred Williams and Company of the one part, and the Company of the other part.**

(*b*) **A Bond dated the 13th day of January, 1891, made between the said Alfred Williams and Company of the one part, and the Woking Water and Gas Company of the other part.**

(*c*) **An Agreement dated the 22nd day of January, 1891, and made between the London Necropolis and National Mausoleum Company of the one part, and the Company of the other part.**

(*d*) **An Agreement dated the 6th day of August, 1891, and made between the said Alfred Williams and Company of the one part, and the Company of the other part.**

The above contracts, together with a print of the Order and the Act of Parliament confirming the same, and copy of the Memorandum of Association, may be inspected at the Office of the Solicitor to the Company in London.

Other contracts may have been entered into within the meaning of section 38 of the Companies' Act, 1867; but applicants for shares shall be deemed to waive their rights to specification of any particulars of such contracts, whether under the above section or otherwise.

The prospectus and forms of application can be obtained at the Offices of the Company, or from the Bankers or Solicitors. Applications for shares must be made on the form, on or before the 17th day of October, 1891.

Sept. 16, 1891.

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LUX's Regulator for Gas-Engines.
LUX's Gas-Balance.
LUX's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

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For prices and terms apply Botolph House, Eastcheap, LONDON, EC.

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Apply, by letter, to No. 2008, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

A GAS Engineer (Stud. Inst. C.E.) is open to accept an appointment as ASSISTANT MANAGER in a large Gas-Works. Good Draughtsman and Chemist. Considerable experience with Oil Gas, Inclined Retorts, &c. First-class testimonials.

Address No. 2010, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AN Assistant Gas Manager of medium-sized Works, having ten years' practical experience, desires a Situation as MANAGER of medium-sized Works, or ASSISTANT in large Works. First-class testimonials as to character and ability.

Address No. 2006, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SITUATION wanted as Foreman by an experienced Mechanic. Well up in Chemical and Acid-Making Plants. Capable of erecting Gas or Steam Engines. Can work out own Drawings and Specifications. Good references. Age 35.

Address No. 2011, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Address No. 2005, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Carnforth Gas Company, a GAS-FITTER. One able to do Main and Service laying and rough Smithing preferred.

Applications, with copies of testimonials, to be sent to the undersigned.

H. LAWTON,
Manager.

WANTED, an experienced Stoker for the Gorleston and Southtown Gas Company. Must be sober and steady, and used to the Shovel, Exhauster, and Engine. Married man, to live in one of the Cottages on the Works.

Apply, with references as to character and ability, to W. PALGRAVE BROWN, Southtown, GREAT YARMOUTH.

WANTED, by the Milford Improvement Commissioners, a steady and trustworthy GAS STOKER, for night duty to start. Must be used to Shovel Charging and Exhauster and Engine. Wages 24s. per week, Winter and Summer. Make about 4 million cubic feet per annum.

For further particulars apply to

THOMAS JOHN,
Superintendent.

Gas-Works, Milford Haven,
Oct. 3, 1891.

WANTED, a General Manager for a Company engaged in granting Licenses for the Manufacture of Gas used chiefly as an Enricher. The following qualifications indispensable: Thorough knowledge of Gas-Works; experience acquired in responsible position in large Gas-Works, and good general business experience; undoubted references, especially as to business capacity. The appointment will not be made until the 15th of October. Liberal Salary.

Address GAS MANAGER, 71, King Street, MANCHESTER.

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WANTED, the last Edition of "King's Treatise on the Science and Practice of the Manufacture and Distribution of Coal Gas," "Hartley's Gas Analyst's Manual," "Newbigging's Handbook for Gas Engineers," and Francis Sutton's "Volumetric Analysis."

Address No. 2009, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—The Copies of the "Journal OF GAS LIGHTING" (not bound) from No. 515, July 2, 1872, to No. 1468, June 30, 1891. The numbers are in good condition. The copies missing are 871, 872, and 876, of the year 1880.

Offers to No. 2007, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

BOROUGH OF STOCKTON-ON-TEES.

THE Gas Committee of the Stockton-on-Tees Corporation are prepared to receive TENDERS for a TREBLE-LIFT GASHOLDER.

Plans and Specification may be seen at the Gas-Works on application to Mr. W. Ford, Gas-Manager.

Tenders, endorsed "Gasholder," to be sent to me not later than the 20th of October next.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
MAT. B. DODDS,
Town Clerk.

TO RETORT AND FIRE-BRICK MANUFACTURERS.

THE Corporation of Bury are prepared to receive TENDERS for RETORTS, FIRE-BRICKS, and FIRE-CLAY required at their Gas-Works.

Forms of tender may be obtained from Mr. W. H. S. Gendall, Gas Engineer, Elton, Bury.

Tenders, sealed, and endorsed "Tender for Retorts, &c," to be sent in to me not later than Monday, the 19th of October, 1891.

By order,
JOHN HASLAM,
Town Clerk.

Bury, Oct. 1, 1891.

GREAT WIGSTON GAS COMPANY.

GAS TAR.

THE Directors of the above Company, invite TENDERS for the surplus TAR for One year ending Sept. 30, 1892 (probable quantity, about 80 tons), delivered into tanks on the Midland Railway Company's Sidings, or into boats on the Old Union Canal at Thilby Bridge.

Payments monthly.

The Directors do not bind themselves to accept the highest or any tender.

Tenders to be addressed to JOHN A. HARRIS, Manager, by the 21st inst.

FENTON URBAN SANITARY DISTRICT.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 3000 tons of good GAS BURGY, to be delivered at the Works, commencing from the 1st of January next.

For further particulars apply to the Manager.

Tenders to be sealed and endorsed "Tender for Coal," and addressed to the Chairman, Gas-Works, Fenton, on or before Tuesday, the 20th inst.

F. H. DARWIN,
Manager and Engineer.

Gas Offices, Fenton,
Sept. 25, 1891.

CANTERBURY GAS AND WATER COMPANY.

TO IRONFOUNDERS AND CONTRACTORS.

TENDERS are invited for 700 12-inch CAST-IRON MAIN PIPES (12 feet long), and Connections.

A Specification, Form of Tender, and particulars, will be forwarded on receipt of stamped and addressed envelope.

Sealed tenders, endorsed "Tender for Pipes," to be delivered at the Company's Offices, Castle Street, Canterbury, on or before Saturday, the 24th of October next.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
JAMES BURCH,
Secretary.

Canterbury, Sept. 29, 1891.

CORPORATION OF LEICESTER.

SULPHURIC ACID.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of SULPHURIC ACID made either from Native Sicilian Brimstone, Recovered Sulphur, or Pyrites. Specific gravity in each case to be stated. The price to include free delivery by Rail into elevated Tanks (27 feet high) at the Chemical Works, Aylestone Road Gas-Works.

Probable quantity about 1200 tons, to be delivered as required, during the ensuing Twelve months.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Acid," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, Oct. 10 next.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M. Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane,
Leicester, Sept. 24, 1891.

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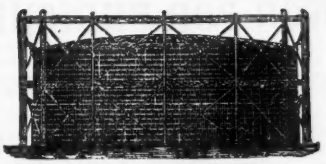

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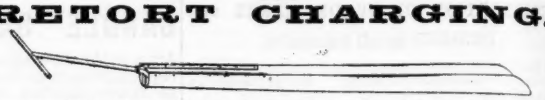

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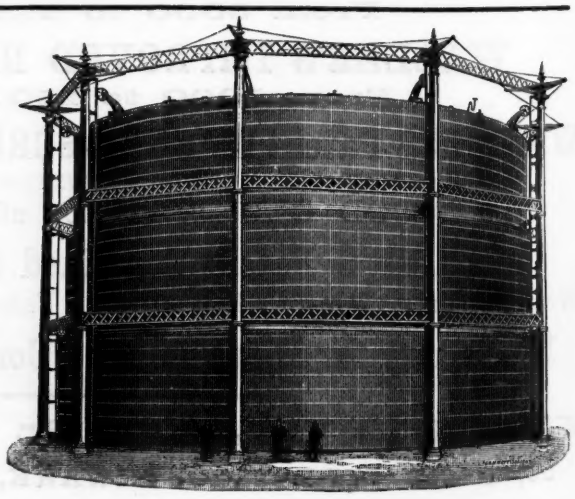

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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable, while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

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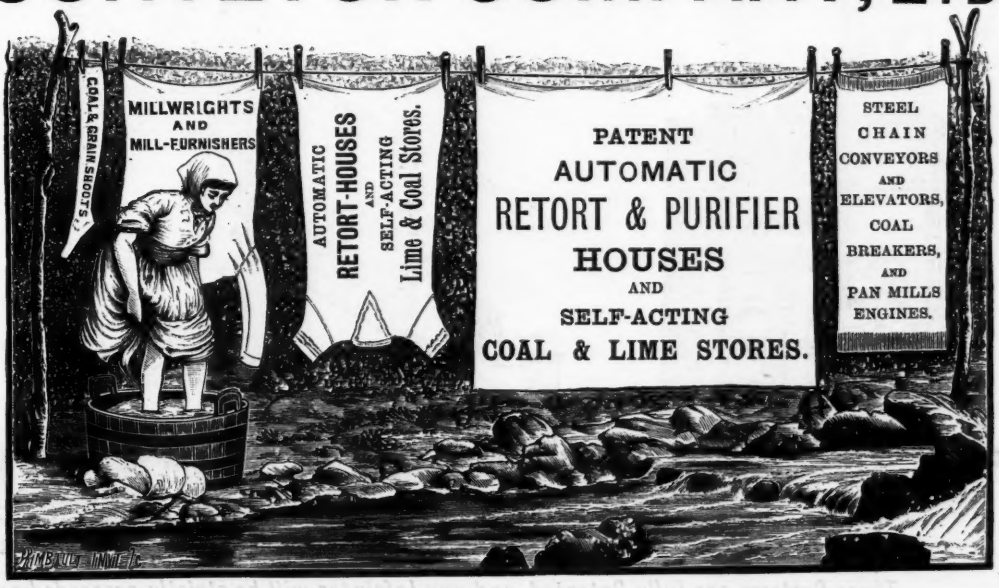
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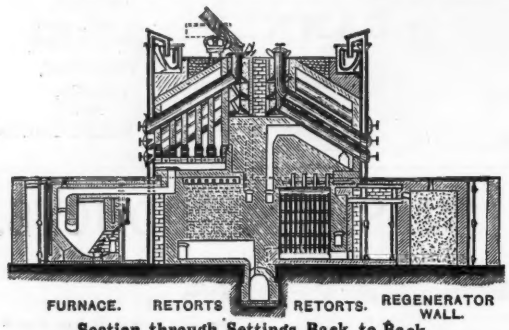
PATENT AUTOMATIC RETORT & PURIFIER HOUSES AND SELF-ACTING COAL & LIME STORES.
STEEL CHAIN CONVEYORS AND ELEVATORS, COAL BREAKERS, AND PAN MILLS ENGINES.

1, METAL EXCHANGE BUILDINGS, LONDON, E.C.

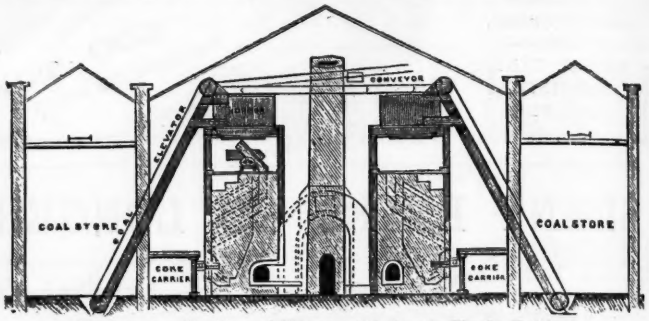
AUTOMATIC SYSTEM OF
CHARGING & DRAWING INCLINED GAS-RETORTS.

Gold Medal, Paris Exhibition, 1889.

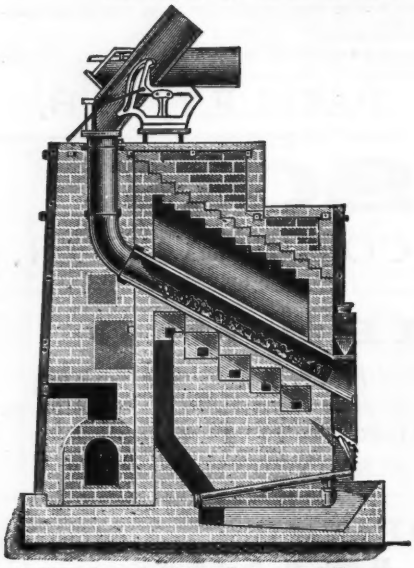
This System of Automatically Charging and Discharging Retorts without machinery or arduous labour is in operation at several places on the Continent and in America, and will shortly be at work in various Gas-Works in England.



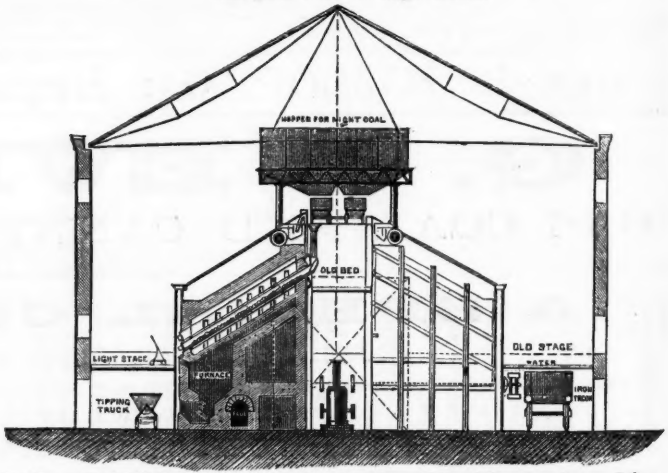
Section through Settings Back to Back.
Working off ground floor with Generator under Stage and Regenerator under the Sets.



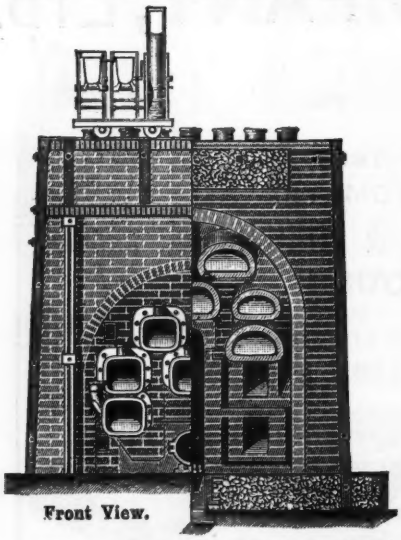
Transverse Section of House with Coze's Single Settings,
Showing Method of working Two Single Settings and Distributing the Coal to the Supply Hoppers; the whole of the work being Automatic.
This plan is for a large House.



Section through Middle Retort and Furnace.

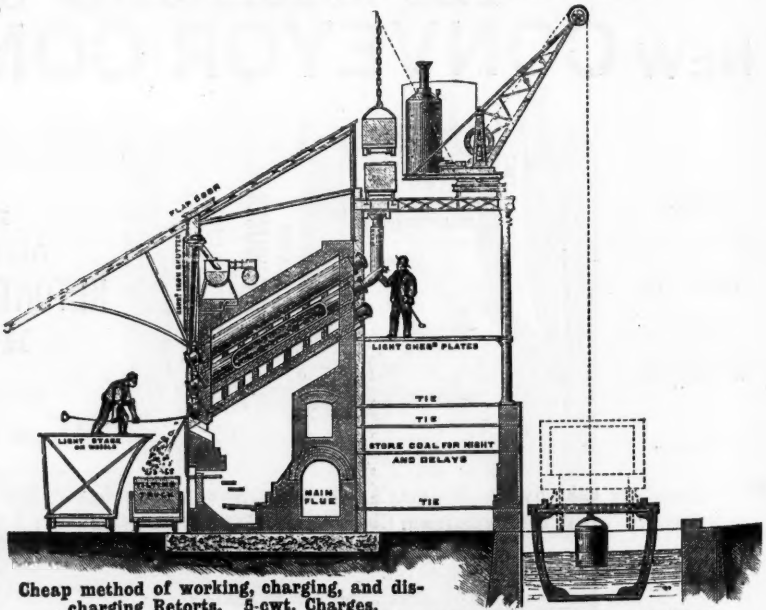


Section of old Retort-House converted, Two Sets 20 fts. in place of One.
Modified form, with ordinary Retorts and Fittings.



Front View.

Section through Furnace & Bed.



Cheap method of working, charging, and discharging Retorts. 5-cwt. Charges.
Section through Setting, Front to Back. Coal Barge or Railway.
Light Corrugated Roof over Sets and at Sides.

These Systems are fully Patented, and any Infringer will be strictly proceeded against.

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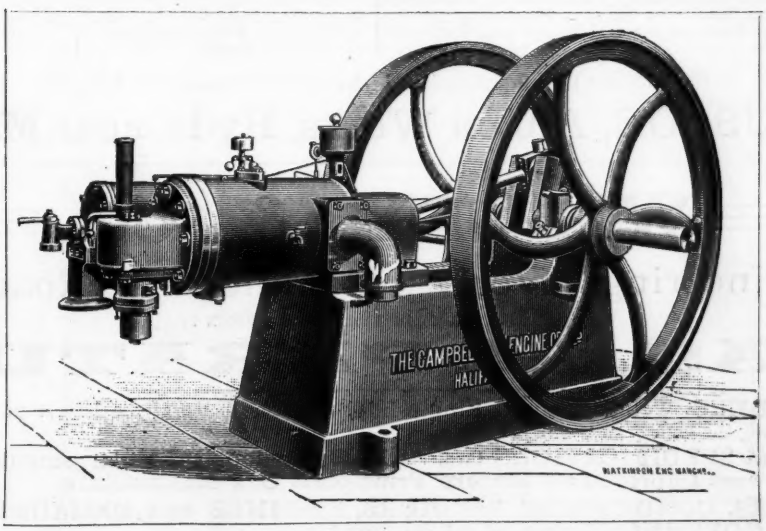

MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E.; at the Sydenham Gas-Works; Tiverton Gas-Works; Filey Gas-Works, &c.

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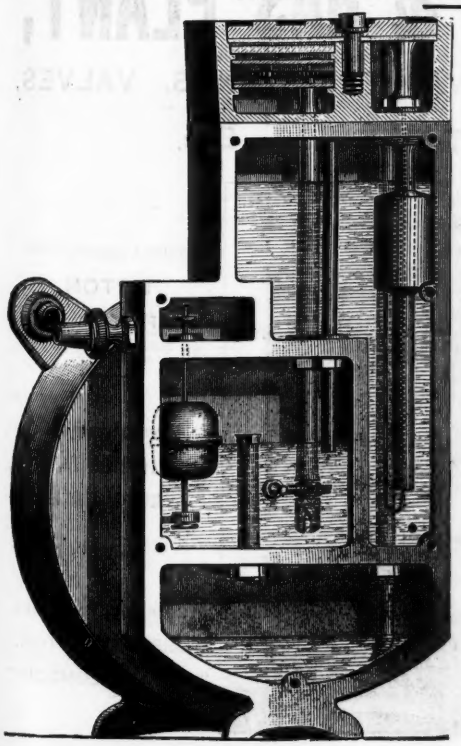

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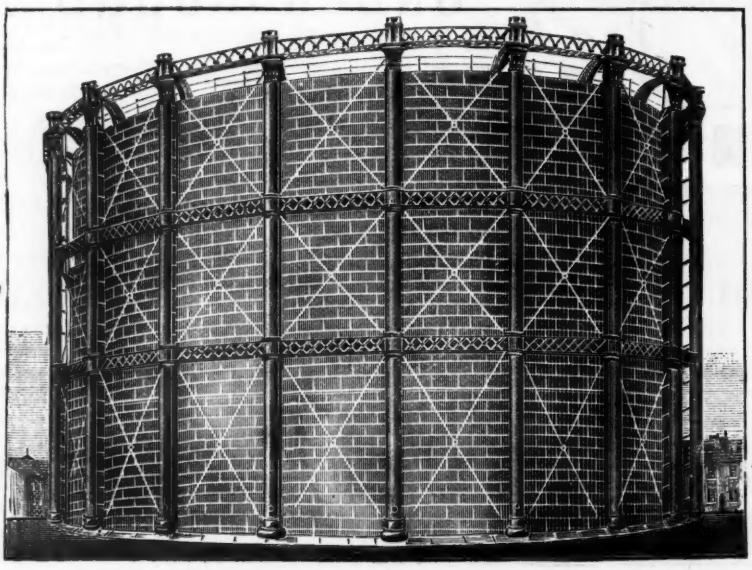

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Analysis: 12,600 feet of 19-candle gas per ton.
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Telegrams: "ATLAS SHEFFIELD."

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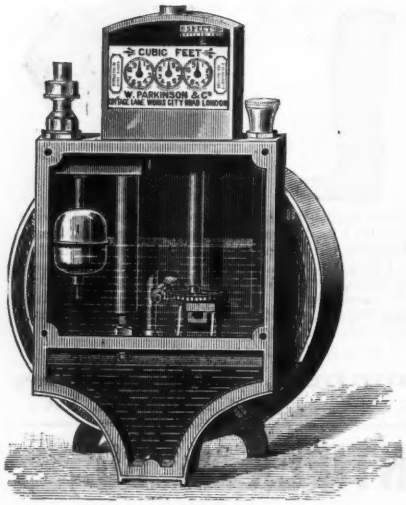
THE ORIGINAL MANUFACTURERS OF WET METERS.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

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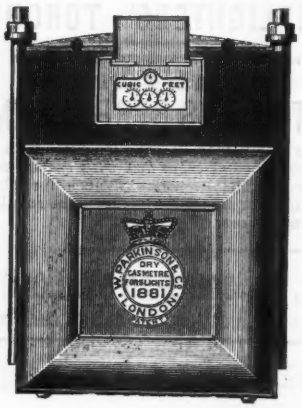
The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.



DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected and the brasswork and smaller fittings are of superior workmanship.

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Telegraphic Address: "GAS-METERS."

10, MAWSON'S CHAMBERS, DEANSGATE.
MANCHESTER.
Telegraphic Address: "PRECISION."
[See also Advt., p. 610.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Oct. 6, 1891.